

100th ANNIVERSARY • NAVY CIVIL ENGINEER CORPS

1867



1967

Men-Methods-Materials

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FOREWORD

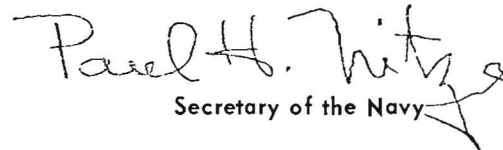
Congratulations to the Navy Civil Engineer Corps on its 100th Anniversary and its precocious offspring, the Seabees, simultaneously marking their 25th year.

Although the Navy's Construction Forces—the Seabees who are among the newer elements of the Navy—are observing their 25th Anniversary this year, they have already become a legend. Throughout the Navy and the Marine Corps, they have instilled confidence in their “CAN DO” motto. Their steadying hand is provided by the Navy Civil Engineer Corps.

They earned their colorful and commendable reputation as “doers” doing the island-hopping Pacific campaigns of World War II. In Korea, they again proved their mettle. Now, in South Vietnam, another generation of Seabees is carrying on their tradition as “builders—fighters”.

It was a Seabee who, at Dong Xoai, earned the Navy's first Medal of Honor in Vietnam. At Chu Lai, they were with the first Marines to land. In just 23 days, they “delivered” an operational airstrip. They have built airfields, port facilities, supply depots, hospitals and the countless other facilities which stand as monuments to Seabee ingenuity in Vietnam. And they have been called upon to defend what they have built!

I would like to take this opportunity not only to congratulate, but to commend, the Navy Civil Engineer Corps, which has performed so remarkably over the past 100 years, and the Seabees, who have acquitted themselves admirably as the construction arm of the Navy.


Secretary of the Navy

1867-1881
Captain
William P. S. Sanger



William P. S. Sanger, the first Chief of Navy Civil Engineers, with the official title of Senior Civil Engineer, was commissioned on March 3, 1867, a day after Congress passed the authorizing act.

Sanger was not only the first man commissioned as a Navy Civil Engineer, he also served with the Navy as a civil engineer longer than any other man, nearly 55 years of continuous service. He was first hired as a Navy civil engineer by Loammi Baldwin to be Baldwin's representative during the construction of the first drydock in the Navy Yard at Norfolk, Virginia. Actually, Sanger was a lad of 17 and an apprentice to Baldwin. Baldwin trained the young man in the art of civil engineering during the construction of the dock between 1827 and 1833.

Sanger remained at Norfolk until the dock was completed. Shortly afterward, Baldwin died, and the Navy Board of Commissioners appointed Sanger as his successor. When the Bureau of Navy Yards and Docks was founded in 1842, Sanger was appointed Senior Civil Engineer.

Under the authority of a Congressional Statute of March 2, 1867, Secretary of the Navy Gideon Welles ordered the commissioning of Navy civil engineers. This marked the founding of the Navy Civil Engineer Corps, a dream realized for Sanger who had been urging its creation for years. He was promptly appointed Senior Navy Civil Engineer and was commissioned into the Navy.

During Sanger's long career as Senior Civil Engineer, the Navy fought two wars and evolved from a weak conglomeration of wooden sailing ships—some of which dated back to the Revolutionary War—into a modern, steam-propelled, ironclad fleet.

When he first went to work for the Navy, facilities for the Fleet were a few small Navy yards on the eastern seaboard. When he retired, the Navy had huge yards on both coasts to service the Fleet in the Atlantic and Pacific Oceans and was building coaling stations on islands across the Pacific toward Asia.

While Sanger was a Navy civil engineer, the first permanent floating drydocks were built. The first prefabricated—and the first iron ship—the USS **Michigan** was launched in 1843; and the first Navy yard on the west coast, Mare Island, was built. The Navy changed from sail to steam and four-bladed screw drive. The Navy Academy was founded, and the civil engineers helped design and build the facilities. Navy yards and stations were laced with telegraph wires and poles as communications advanced. The new Philadelphia Navy Yard at League Island was constructed, which was the first Navy Yard built to service the new iron ships. The list of firsts in Sanger's career is almost endless.

Sanger devoted almost his entire life to the Navy Civil Engineer Corps, starting as a youngster of 17 and retiring at the age of 72. He was born in Massachusetts in 1809, and retired from the Navy on October 15, 1881. He died in Washington, D. C., on February 16, 1890.

On November 1, 1965, Rear Admiral Alexander C. Husband became Chief of the Navy's Civil Engineers and Chief of the Bureau of Yards and Docks. He inherited a vast naval shore establishment and an expanding wartime naval construction program in Southeast Asia.

Today, the Chief's responsibilities are enormous. The United States naval shore establishment is valued at more than \$20 billion, and the Navy's Civil Engineers plan, design, repair, and maintain more than 1,000 installations that contain 100,000 buildings, 10,000 miles of road, 120 million square yards of airfield pavement, and 2,500 miles of railroad.

Under Admiral Husband's command are about 2,000 Civil Engineer officers, nearly 20,000 Seabees, and over 20,000 civilian workers. This huge group is advancing engineering knowledge and fighting and building as the United States Navy moves deeper into the space age. The revolutionary weapons and technical facilities being developed for the Navy today require new and imaginative engineering and construction techniques and methods.

Admiral Husband, known throughout the corps as "Ace," was born in Troy, New York, on March 27, 1914. He graduated from the United States Naval Academy in 1935 and was immediately assigned to two years of sea duty aboard the cruiser USS **Raleigh**. After his sea tour, the Navy sent him to Rensselaer Polytechnic Institute, and there he earned his master's degree in civil engineering.

During the Second World War, he commanded United States Naval Construction Battalion 128. The battalion participated in the assault on Okinawa. D-Day on Okinawa was April 1, 1945, but four days before the main landings, three platoons of the 128th landed with a force of Marines on the small offshore islands of Kerama Retto to emplace pontoon causeways while under heavy Japanese air and ground attack. When the main body of Seabee troops went ashore on Okinawa with the assault forces, Husband went in with them. For distinguished service in this combat action, he was awarded a Bronze Star Medal with Combat "V."

After the war, Admiral Husband served in many assignments overseas and in the United States and steadily advanced in rank. In May 1964, he was named Deputy Chief of the Bureau of Yards and Docks. He became Chief of Civil Engineers of the Navy and Chief of the Bureau on November 1, 1965. After he assumed command, the United States Navy was reorganized, and the Bureau of Yards and Docks became the Naval Facilities Engineering Command. Admiral Husband was named Commander.

Throughout the world in 1967, especially in Vietnam, the Civil Engineers of the Navy and the Seabees are planning and building and maintaining hundreds of bases and installations, bridges, roads, airfields, and hospitals. All this is being done under the direction of Rear Admiral Alexander C. Husband.

1965- Rear Admiral Alexander C. Husband



THE CIVIL ENGINEER CORPS—A BRIEF HISTORY

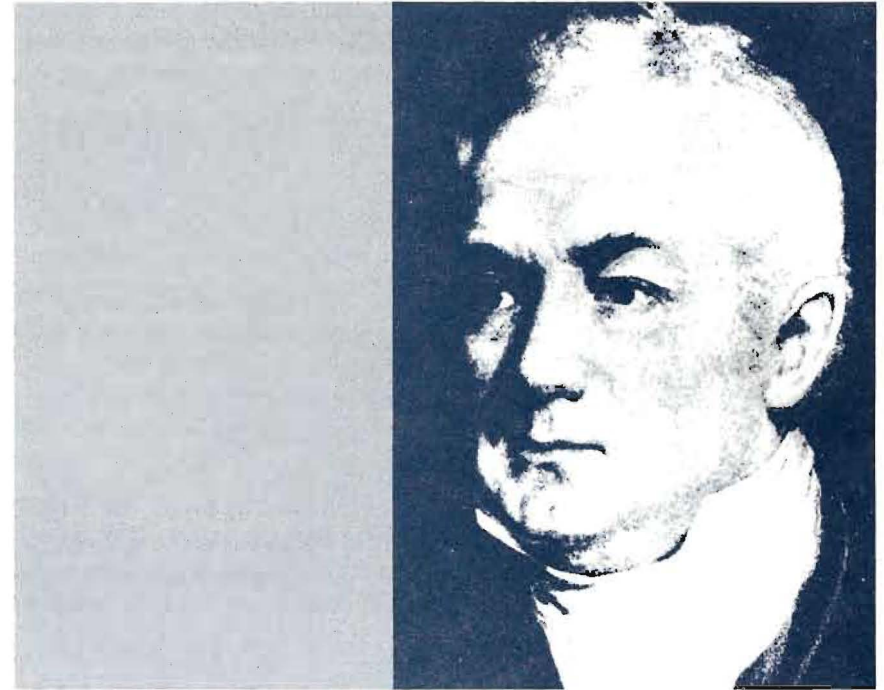
For the fighting fleet of the United States Navy, land-based support is a key factor—hence, the Naval Shore Establishment and the birth of the Civil Engineer Corps (CEC). The CEC is executor of the plans and programs of the Naval Facilities Engineering Command, and is comprised of commissioned and warrant officers trained in many engineering professions. Although the Corps is marking its 100th anniversary, the need for Navy civil engineers was recognized as early as the 1790s when the first United States ships were commissioned.

The need for Fleet support led to the establishment of the Navy Department in 1798 and the appointment of the first Secretary of the Navy, Benjamin Stoddert. In 1801, Thomas Jefferson appointed Benjamin Henry Latrobe, a civilian, as the Navy's first civil engineer. He was to submit plans for a drydock that would hold twelve 44-gun frigates. Unfortunately, Latrobe's plans were turned down by Congress, and he died in 1820 without seeing fruition of his proposals.

In 1826, the Navy chose Loammi Baldwin of Boston to be its civil engineer and directed him to prepare plans for two drydocks. As a result of his surveys and estimates, the first Navy-owned shore facilities were started in 1827. Baldwin appointed William P. S. Sanger to represent him at the yard at Norfolk and Alexander Parris to represent him at the yard in Boston. These projects were completed in 1834, and in 1836 Sanger was appointed as the Navy's Civil Engineer. He continued in this capacity through the naval reorganization of 1842, when the bureau system replaced the Board of Navy Commissioners.

In 1842 the new Bureau of Navy Yards and Docks administered seven yards, four hospitals, ammunition magazines, and recruiting offices, as well as the Navy's timber lands. With the advent of steam as a means of ship propulsion, the Navy was able to move inland, using such waterways as those of the Mississippi system. These new areas needed protection and support, and Sanger visited Memphis in 1844 to select a site for a shore facility. Nothing came of the Memphis project, but as a result of Sanger's efforts to extend naval shore facilities, the Mare Island Navy Yard on San Francisco Bay was established in 1854.

Under Sanger's direction, civil engineers were engaged at various Navy yards. A growing workload of planning and construction ensued. Coaling stations to support steam propulsion had to be built at home and abroad. The increasing size of the Navy imposed severe demands on the engineers charged with designing and constructing facilities to meet its needs.



Loammi Baldwin

Because of experience gained in construction activities during the Civil War, the Bureau of Yards and Docks determined that the Navy's civil engineers, who were civilians, could operate more efficiently as commissioned officers.

Therefore, on March 2, 1867, Congress passed legislation which authorized commissions for the Navy's civil engineers. This act officially inaugurated the Civil Engineer Corps, with Sanger, now Captain Sanger, as the Chief of Navy Civil Engineers. At that time, the Civil Engineer Corps had six officers in addition to Sanger: B. F. Chandler, Charles Hastings, F. A. Stratton, W. M. Spear, J. D. Hoffman, and Ralph G. Packard.

In 1871, Congress accorded Navy civil engineers relative rank and precedence with line officers, and 10 years later authorized them to wear line officer uniforms.

Iron ships required new Navy yards and new shipbuilding specifications. New docking facilities were required for the growing Pacific trade and with the acquisition of Alaska in 1867. By 1890, 13 Navy yards and stations with 10 drydocks were in existence.

The war with Spain in 1898 marked a new era for the Civil Engineer Corps. In that year, Rear Admiral Mordecai T. Endicott became the first member of the Corps to direct policies as



This picture, taken in 1870, shows five of the early Navy civil engineers. From left to right, B. F. Chandler, F. C. Prindle, W. P. S. Sanger, F. A. Stratton, and Charles Hastings.

Chief of the Bureau of Yards and Docks. In 1906, Congress enacted a law specifically providing that the Chief of the Bureau of Yards and Docks should be chosen from the ranks of the Navy's Civil Engineer Corps.

During the first years of the 20th century, the United States became increasingly involved in world affairs. The Navy civil engineers also became involved in the technological advances. The treaty that followed the war with Spain led to the establishment of naval stations at Puerto Rico, Cuba, Guam, and the Philippines. The yards at Boston, Norfolk, and Philadelphia were expanded, and a new one took shape at Charleston, South Carolina.

CEC officers constructed floating drydocks, including the famous **Dewey** floating drydock. Shops and waterfront facilities underwent modernization. After 1904, Navy civil engineers provided for the generation and distribution of electric power at Navy yards. By a Congressional act of 1911, all Navy public works were made the responsibility of the Bureau's engineers. Since that date, the CEC has stimulated the growth of the Naval Shore Establishment.

CEC activities outside the Bureau were also notable. In 1907, Harry Rosseau, a Civil Engineer Officer, was a member of the Isthmian Commission which supervised the building of the Panama Canal. Robert E. Peary, another Civil Engineer Officer, led numerous polar expeditions and in 1909 discovered the North Pole. He also foresaw the significance of airpower in naval warfare, even before World War I.

During World War I, BuDocks construction projects totaled \$347 million—more than the cost of all previous construction. Between the two world wars, the principal tasks for the engineers were salvage and disposition of surplus materials, deactivation of ships, and disestablishment of some stations. At the end of 1939, CEC strength was less than 150 officers.

World War II brought on an unprecedented building boom, especially after the attack on Pearl Harbor. CEC reserve officers were recruited, and the Corps reached a peak of 10,000 officers. The war also saw the establishment of the Seabees, who have continued to perform magnificently in naval construction. Rear Admiral Ben Moreell, Chief of the Bureau and the Civil Engineers at that time, put into practice the idea of having construction battalions under the supervision of CEC officers.

In the Pacific, Seabees under the direction of Civil Engineer Corps officers built 111 major air strips, 441 piers, 2,558 ammunition magazines, 700 square blocks of warehouses, hospitals for 70,000 patients, tanks for storing 100 million gallons of gasoline, and housing for 1,500,000 men. At Espiritu Santo in the New Hebrides, elements of the first Naval Construction Battalion constructed a 5,000-foot airstrip from virgin jungles in 20 days. From this airstrip bombers destroyed the basic Japanese air base nearing completion on Guadalcanal. Then the Marines invaded Guadalcanal and engaged in the battle that finally reversed the course of the war.

In the Atlantic, Civil Engineer Corps officers directed Seabees in performing similar feats of construction and in addition designed the pontoon causeways that made the landings at Sicily, Salerno, and Anzio possible. Civil Engineer Corps officers also commanded the Seabees who operated the Rhino ferries and handled the great quantities of cargo that contributed so much to the success of the Normandy invasion.

After World War II, CEC activity did not decline as it did after the previous war. The Cold War established a necessity for maintaining military strength and preparedness. The Korean War again caused a rise in the number of CEC personnel. Upsets in Berlin, Cuba, South America, Africa, and especially in Southeast Asia, have kept the CEC and the Seabees busy.

Seabee Teams, commanded by Civil Engineer Corps officers, were formed to aid in civic projects in foreign countries. They have built schools, orphanages, roads, public utilities, and other community development projects, earning for the "Can Do" Seabees an added measure of recognition as "The Navy Peace Corps."

In 1966, the Bureaus in the Navy Department were changed to Commands to represent the various areas of activity. The Bureau of Yards and Docks became the Naval Facilities Engineering Command, and the Chief of Civil Engineers also became the Commander of NAVFAC.

In 1967, the Civil Engineer Corps looks back on 100 years of achievement. The Corps has built, maintained and expanded a Naval Shore Establishment that has provided continuous support to the Fleet and met the test of every national emergency.

Down the decades of peace and war, the officers of the Navy Civil Engineer Corps seek always to meet the challenge in terms of the Corps' informal motto—representative of their spirit and talent—"We Will!"



**Captain
Peter C. Asserson
1881-1898**

One of the more colorful men to reign as Senior Navy Civil Engineer was Captain Peter Christian Assersion, born on the Isle of Egersund off the Norwegian Coast on January 5, 1839.

At the age of 16, he went to sea as a cabin boy and rose to ship's captain before the age of 21. In 1859 he emigrated to the United States and found employment with the United States Coast Survey and Lighthouse Service. He helped with the hydrographic survey of the Gulf of Mexico, then with the construction of the first high-power lighthouse to be built on a shoal 15 miles from shore.

When the Civil War started, Asserson, a Northern sympathizer, escaped from New Orleans by hiring on as ship's master aboard a partly loaded vessel bound for Spain. He returned to New York from Spain and commenced engineering and navigation studies at Cooper's Union. In 1862 he was appointed master's mate in the United States Navy, and later in the war became an acting Ensign. During the war, he commanded several ships which participated in many naval assaults on Confederate strongholds.

After the war, Asserson went on duty at the Norfolk Navy Yard, then he was assigned to the coast survey in command of the USS **Hasler**. In 1869, he was honorably discharged as a volunteer officer.

Asserson became a naturalized citizen in 1871. Two years later, partly as a result of his success in raising sunken ships from eastern rivers, he was appointed Superintendent of Improvements at the Norfolk Navy Yard. Then in March, 1874, he was commissioned a Civil Engineer in the United States Navy and put in charge of the Norfolk Navy Yard's reconstruction. On October 15, 1881, as a Commander, Asserson was appointed Senior Navy Civil Engineer, a position he retained until 1898. He was made Captain in 1882.

In April, 1898, Asserson was offered the post of Chief, Bureau of Yards and Docks. He declined the appointment and about the same time stepped down from his post as Senior Civil Engineer. This made way for Mordecai Endicott to become the first man to be Chief of both the Bureau and of the Navy Civil Engineers. Asserson remained on active duty until 1902 when he retired. He died on December 6, 1906, in Brooklyn, New York.

**Rear Admiral
M. T. Endicott
1898-1907**



Born in May's Landing, New Jersey, on November 26, 1844, a direct descendent of the first governor of Massachusetts Bay Colony, Mordecai Endicott graduated with a degree in civil engineering in 1869 from Rensselaer Polytechnic Institute. In 1871, he was appointed assistant civil engineer at the League Island Naval Station, Philadelphia. He was commissioned as a civil engineer in the United States Navy on July 13, 1874, and in that capacity spent the next 16 years in various eastern Navy Yards.

On April 7, 1898, President William McKinley broke the precedent of appointing a line officer to head the Bureau of Yards and Docks and appointed Civil Engineer Endicott to that position. Endicott was immediately elevated to the rank of Commodore, and shortly afterward he became a Rear Admiral, the rank that all Chiefs have held ever since. He was reappointed Chief in 1902 and again in 1906.

During his administration, the famous **Dewey** floating drydock was built, electric lights and appliances were installed in Navy yards, and the first power plant system was devised. As an additional duty, he served on the Panama Canal Commission, an assignment he undoubtedly owed to his having served on the Isthmian Commission in 1895 when he went to Nicaragua to study the feasibility of building a canal there.

Although Endicott resigned as Chief in 1907, he continued on active duty for several months until appointed to the Justice Department as technical advisor. He served in that capacity until 1909 when he was relieved of all duty. In 1914 and in 1917, respectively, he was again called to serve in the Justice Department as advisor and to assist the Bureau of Yards and Docks during World War I. He died on March 5, 1926, and was buried with honors in Arlington National Cemetery.



**Rear Admiral
H. H. Rousseau
1907-1907**

Rear Admiral Rousseau, at the age of 36, was the youngest man ever to attain the rank of Rear Admiral in the United States Navy, the youngest ever to head the Bureau of Yards and Docks, the youngest ever to be appointed Chief of Civil Engineers, and the only Navy Civil Engineer to be personally honored with his likeness on a postage stamp.

Born in Troy, New York, on April 19, 1870, Rousseau gained his degree in civil engineering from Rensselaer Polytechnic Institute in 1891. He was commissioned a Junior Lieutenant in the Navy Civil Engineer Corps in October, 1898. He served in the Bureau of Yards and Docks until 1903 when he was transferred to Mare Island Navy Yard, California.

On January 6, 1907, Rousseau was named to head the Civil Engineer Corps and was given the temporary rank of Rear Admiral. The unprecedented promotion was thought to be a move by President Theodore Roosevelt to assure Rousseau's appointment to the Isthmian Canal Commission, where his rank would be on a par with that of other members of the Commission.

Rousseau took his place on the commission three months later and reverted to his permanent rank of Senior Lieutenant because he no longer was Chief of the Bureau. When Lieutenant Colonel Goethals, the head of the Commission, became governor of the Panama Canal Zone in 1914, Rousseau was named Engineer of Terminal Construction and was responsible for the building of locks, drydocks, floating cranes, fueling depots, and repair shops. For his outstanding work in Panama, Rousseau was advanced from Lieutenant Commander to the permanent rank of Rear Admiral by a special act passed in March, 1915. His monumental administrative efforts earned him the Navy Cross for meritorious service.

Rear Admiral Rousseau died "in harness" on July 24, 1930, aboard the SS **Cristobal** enroute to the Panama Canal to inspect the railway.

Rear Admiral R. C. Hollyday 1907-1912



Rear Admiral Richard C. Hollyday, lawyer, engineer, and radio pioneer, directed the construction of the country's first radio transmitting station—the Wireless Station in Arlington, Virginia—while he was Chief of Civil Engineers and Chief of the Bureau of Yards and Docks.

Born in Easton, Maryland, November 13, 1859, Hollyday began a law career after earning a degree from Washington and Lee University, but he soon switched to engineering and went to work for the Baltimore and Ohio Railroad.

After several other civilian jobs, Hollyday accepted a commission in the Navy Civil Engineer Corps on March 13, 1894. Just 13 years later he was appointed Chief. One of his first tasks was the engineering and construction of the Wireless Station, which was commissioned after completion in 1913. Other accomplishments of Hollyday's administration include the installation of improved ordnance magazines and shell-storage depots at nearly every shore establishment, construction of new drydocks at the New York and Pearl Harbor Navy Yards, and the design and construction of seven 150-ton floating cranes at other Navy Yards.

After his term as Chief, Hollyday became the Engineering Officer in Charge of the Wireless Station. While there, he became friends with radio pioneers David Sarnoff and Lee De Forest. Later, the station and these men were to help in the first radio navigational experiments conducted with the help of the French government. Radio signals from the Wireless Station to the French receiver on the Eiffel Tower in Paris aided greatly in the early development of radio navigation.

Hollyday retired from active duty on November 13, 1923, and died in Easton, Maryland on November 17, 1936. During World War II, the Naval Construction Battalion Center at Gulfport, Mississippi, was named Camp Hollyday in his honor.



Rear Admiral H. R. Stanford 1912-1916

Homer R. Stanford graduated from Washington University in St. Louis, Missouri, in 1888 with a Bachelor of Engineering degree. For the next 10 years he engaged in general engineering practice. Stanford came into the Navy Civil Engineer Corps in 1898 and was commissioned a Lieutenant (jg) on the basis of a high grade in a competitive examination. After indoctrination at the Bureau of Yards and Docks, he was sent to the Boston Navy Yard and from there to the Philippine Islands to plan and set up specifications for a coaling station.

When recalled from the Philippines, Stanford was assigned to various Navy Yards in the United States. His efficient handling of construction at Philadelphia was undoubtedly a factor in bringing about his appointment as Chief of the Bureau of Yards and Docks and Chief of Civil Engineers and his promotion to Rear Admiral in January 1912. Stanford's tenure as Chief was notable for the solution of a number of complex engineering problems. The most outstanding was the completion of a large masonry drydock at Pearl Harbor.

After finishing his term as Chief in 1916, Stanford reverted to his permanent rank as Captain. As Public Works Officer at Boston, he provided designs and plans for a new drydock to be used by naval ships. For his work in the Boston district during World War I, he was awarded the Navy Cross.

Stanford served in many areas following his Boston assignment until his retirement in 1929. In 1940, he published a history of the Potomac River. On April 7, 1947, at the age of 81, Admiral Stanford died in the United States Naval Hospital, Bethesda, Maryland.



**Rear Admiral
F. R. Harris
1916-1917**

Rear Admiral Frederic R. Harris, Chief of Navy Civil Engineers and Chief of the Bureau of Yards and Docks from January 21, 1916, to November 30, 1917, was noted for being a quiet, able administrator. It was Harris who foresaw the need for rapid expansion of naval facilities in World War I and who began building up the Navy Shore Establishment as the war loomed during his administration. He applied himself to the grinding detail of improving and expanding the Navy building slips and building ways, the drydocks and berthing areas, and the shops and power plants.

Born April 10, 1875, in New York City, Harris received a degree in mechanical engineering from the Stevens Institute of Technology, in 1896. He was commissioned a Lieutenant (jg) in the Navy Civil Engineer Corps in 1903. Just 13 years later, he was promoted to Rear Admiral and named Chief.

During his administration, Harris appeared before a congressional committee investigating the feasibility of merging the Bureau of Yards and Docks with the Bureau of Construction and Repair. His testimony during this period was influential in causing the matter to be dropped.

Following his tenure as Chief, Admiral Harris became General Manager of the Emergency Fleet Corporation, charged with the expansion of the wartime merchant fleet. He retired in 1927 and operated a firm of consulting engineers, F. R. Harris, Inc., in New York. During World War II, he was again called upon, as a civilian, to help in the expansion of the Naval Shore Establishment. On July 20, 1949, he died in his home in New York and was interred in Arlington National Cemetery.

Rear Admiral Charles W. Parks 1918-1921



Completion of the Navy's massive buildup of shore establishments during World War I came under the direction of Rear Admiral Charles Wellman Parks, when he became Chief of Civil Engineers and Chief of the Bureau of Yards and Docks on January 11, 1918. It was the largest naval construction program to be run by one man to that date. The Navy spent more money in this program than in all the public works projects of its previous history.

Parks was born in Woburn, Massachusetts, on March 22, 1863. He earned a degree in civil engineering at Rensselaer Polytechnic Institute in 1884, then spent the next seven years as a professor of physics there. In 1899, at the request of the United States Government, he served as Commissioner of Education and Liberal Arts to the Paris Exposition.

At the age of 34, Parks was commissioned an Ensign in the Navy Civil Engineer Corps. From then on he rose swiftly through the ranks. In 1905 he was sent to Europe to study the use of steam turbines to generate direct-current electricity. Later, as Public Works Officer at Pearl Harbor, he supervised construction of what up to that time was the largest Navy masonry drydock. The drydock was considered to be the Navy's most difficult engineering feat.

Forced to retire as Chief in 1921 because of ill health, Parks was awarded the Distinguished Service Medal. He retired from the Navy in February, 1922, and died in June, 1930. During World War II, the Navy's Construction Battalion Replacement and Recuperation Center at Pleasonton, California, was named Camp Parks in his honor.

Rear Admiral L. E. Gregory 1921-1929



In the period immediately following World War I, it was the duty of Rear Admiral Luther E. Gregory to maintain the high professional standards of the Navy Civil Engineer Corps while he was plagued by budgetary reductions. To his credit, the Corps came through the period as a well-respected engineering organization.

Gregory served as Chief of the Bureau of Yards and Docks and Chief of the Civil Engineers from December 20, 1921, to December 21, 1929. During his administration, he directed the complete preparation of the Bureau manual and the compilation of the standards of design. President Herbert Hoover appointed him to a committee to study the feasibility of building a bridge from San Francisco across the bay to Oakland.

Gregory was born on January 9, 1872, in Newark, New Jersey. He graduated from Columbia School of Mines, New York, with a civil engineering degree in 1893. For four years after graduation, he remained at Columbia University as Assistant Professor of Mechanical Engineering.

On April 15, 1898, a few weeks after the outbreak of the Spanish-American War, Gregory was commissioned a Lieutenant (jg) in the Civil Engineer Corps. He saw service in various shore stations, rising steadily through the ranks. On retiring as Rear Admiral on December 21, 1929, he made his home in Seattle, Washington, but remained active in state government by heading the state liquor control board. He died September 13, 1960, at the age of 88.



**Rear Admiral
A. L. Parsons
1929-1933**

Although the nation was gripped in one of the greatest depressions in history during the administration of Rear Admiral Archibald Parsons as Chief of Civil Engineers and Chief of the Bureau of Yards and Docks, he did his best to preserve the integrity and high standards of these organizations.

Born in Derry, New Hampshire, on September 20, 1875, Parsons attended the Massachusetts Institute of Technology, where he earned a degree in civil engineering in 1897. Following five years of civilian employment in Massachusetts public works projects, he was commissioned a Lieutenant (jg) in the Civil Engineer Corps in 1903. In assignments at Mare Island Navy Yard and at the Cavite Navy Yard in the Philippine Islands, he showed a remarkable aptitude for designing.

Parsons' talents earned him the appointment as Assistant to the Chief of the Bureau of Yards and Docks. His responsibilities included the design and construction of waterfront and industrial projects at most of the Navy Yards and the construction of a half dozen new Navy hospitals.

For four years, Parsons was attached to the Department of State as a treaty official and served as Engineer in Charge for the Republic of Haiti. He organized and built public works, highway and irrigation districts, and installed a telephone system, made harbor improvements, and conducted a highway bridge program.

On December 23, 1929, he was appointed Chief and served in that capacity until December 22, 1933. Parsons retired in 1938 after 35 years service in the United States Navy. Then he joined another former chief, Frederic Harris, in forming Drydock Engineers, Inc., of New York, which provided consultant service to the Navy during World War II. Admiral Parsons died on September 24, 1953, in New York City.

1933-1937

Rear Admiral Norman H. Smith



Long before the name Seabees and the construction exploits of these indomitable builders became so well known in World War II, groups of Navy men were at work building naval facilities to support the war effort in World War I. These groups were the Navy Public Works Companies first organized in 1917 by Lieutenant Norman H. Smith, the Public Works Officer at the Navy's Great Lakes Training Center in Illinois.

In 1935 when Smith, as a Rear Admiral, was Chief of the Navy's Civil Engineers and Chief of the Bureau of Yards and Docks, he selected Captain Walter Allen, who had followed him at Great Lakes and had organized the Twelfth Regiment (Public Works), to represent the Bureau on the War Planning Board. The concept of construction battalions was introduced to that Board and approved, but since it was to be a wartime measure, it was not put into operation until the start of World War II. At that time, Smith's successor to the office of Chief, Ben Moreell, put the plan into operation and the famous Seabees were born.

Norman H. Smith graduated from Annapolis as a line officer before transferring to the Civil Engineer Corps. As a Civil Engineer Corps officer he served in many of the Public Works Offices at the Navy's major bases and yards in the continental United States and at Pearl Harbor.

In December, 1933, Smith was appointed Chief. When he assumed command, a greatly enlarged naval construction program was underway. Under the direction of the Civil Engineer officers, this program was being augmented by several public works programs established by the Federal Government to alleviate the unemployment created by the depression.

During the administration of Smith, a great number of outstanding projects were completed including a floating drydock of unprecedented size and design, a graving dock at Mare Island Navy Yard, and new battleship moorings at Pearl Harbor.

After serving as Chief for four years, Admiral Smith retired from the Navy. Because of the vast expansion of naval construction activities in World War II, he was recalled to active duty in December, 1942, to become Commandant of Camp Parks and the United States Naval Construction Battalion Replacement and Recuperation Center at Pleasanton, California. In 1943 he was transferred to Houston, Texas, to manage a Navy program established to expedite the production of 100-octane gasoline.

In December 1944, Admiral Smith again left the Navy, this time to become president of the University of South Carolina. He served as president of the university for over seven years.

Under the guiding hand of Ben Moreell, called the "King Bee" by some, the Seabees were first organized and welded into an effective fighting and building force that helped defeat the Japanese, Italians, and Germans. This, combined with other successes in his remarkable career, enabled him to attain the rank of Vice Admiral while he was Chief of the Bureau of Yards and Docks and of the Navy Civil Engineer Corps. He was the first to earn this rank while active as Chief, and at 55 he was the youngest Vice Admiral in the Navy at that time.

Moreell was born in Salt Lake City, Utah, on September 14, 1892. His family moved to St. Louis, Missouri, shortly after his birth, and he grew up there. After earning his degree in civil engineering from Washington University in 1913, he worked as a civil engineer for the city of St. Louis. He was commissioned in the Navy's Civil Engineers in 1917 and posted to the United States Naval Academy for indoctrination. Later, he became the Public Works Officer at Ponta Delgada Navy Base in the Azores.

After World War I, he returned to the United States to serve various Navy Yards as Public Works Officer and served a short tour as Executive Officer to the Engineer in Chief, Republic of Haiti. In 1932, Moreell was assigned to a two-year course at the Ecole National des Ponts et Chaussées in Paris to study European engineering methods. From there he returned to be detailed as assistant design manager of the Bureau of Yards and Docks and to supervise the Model Testing Basin at Carderock, Maryland.

After a few months as Public Works Officer at Pearl Harbor, Moreell became Chief of the Bureau of Yards and Docks and Chief of the Navy's Civil Engineers on December 1, 1937. One of his more timely acts as Chief was to urge the removal of two huge floating drydocks from the mainland to Pearl Harbor. The docks arrived, refurbished and ready, in time to help repair battleships damaged in the Japanese attack on Pearl Harbor. At the same time Moreell also had projects underway on Midway and Wake Islands. The facilities at Midway were completed in time to play a strategic role in the Battle of Midway, the Navy's first significant victory over Japanese forces.

On December 28, 1941, authorization from Moreell initiated the formation of the first Naval Construction Battalions with an original complement of 3,300 men. This action was approved on January 5, 1942. Within four years this number had grown to a peak of 242,000 Seabees. Before the war ended, more than 325,000 men served as Seabees.

With the development of Naval Construction Battalions, Secretary of the Navy Frank Knox granted officers of the CEC the authority to command them. Moreell had pressed for this authority, and it was undoubtedly one of his greatest achievements. He remained as Chief until a few months after the end of World War II, when he was relieved of his command and assigned to temporary duty as Chief of the Material Division in the Office of the Assistant Secretary of the Navy. He retired with the rank of Admiral on June 11, 1946, but his unbounded spirit still keeps him active as an outstanding force in national affairs.

1937-1945 Admiral Ben Moreell



Vice Admiral
John J. Manning
1945-1949



In 1947, the Navy's Civil Engineers were directed by their Chief, Rear Admiral John J. Manning, to oversee the installation of a huge 450-ton bridge crane at the San Francisco Navy Yard. One of the requirements was that the crane should lower a concrete slab weighing 530 long tons to a dock so gently as to crack an egg's shell but not break the yolk.

Manning expected his men to meet other critical requirements, though less fascinating, as a matter of course. He directed the construction of thousands of projects during his administration after the end of World War II. The United States had just entered the atomic age and was on the threshold of the space age. The Navy embarked on construction projects undreamed of a decade before.

One of Manning's first moves as Chief of the Navy Civil Engineers was to establish a force of volunteer reserves. This forward-looking action served the country well, for only three years later the Korean War began.

Much of the work done by Manning's engineers was the reconstruction of Navy bases in the Pacific. Guam, Midway, Wake, and the Philippines were in shambles following their liberation in World War II. On top of the old locations, Seabees built bigger and stronger bases. Manning's Civil Engineers also built the Point Mugu Naval Missile Test Center in California and established the Navy's Engineering Laboratory at Solomons Island, Maryland. They also completed a 350-ton floating crane that had been captured from the Germans and towed to Terminal Island, California.

Manning was born in Troy, New York, July 16, 1894. He graduated from Rensselaer Polytechnic Institute with a degree in civil engineering in 1915. In 1917, he was commissioned a Lieutenant (jg) in the Civil Engineer Corps for duty in World War I. He subsequently served as Public Works Officer in several stations around the world. On his promotion to Captain in 1941, he was appointed Director of the Construction Department of the Bureau. Late in 1942 he was appointed Director, Atlantic Division, Bureau of Yards and Docks, with additional duty on the staff of the Commander in Chief, Atlantic Fleet. He also performed temporary duty under the Commander, United States Naval Forces, Europe, for which he was awarded the Bronze Star for exceptional services in the invasion of France.

In June, 1945, Manning was named Director of the Eastern Pacific Division of the Bureau; then on December 1, 1945, he was appointed Chief of Civil Engineers and Chief of the Bureau of Yards and Docks. On his retirement on November 30, 1949, he was promoted to the rank of Vice Admiral, second highest grade ever held by a Bureau Chief.

Rear Admiral Joseph F. Jelley was Chief of the Navy's Civil Engineers and Chief of the Bureau of Yards and Docks from December 1, 1949, until November 3, 1953. During his tenure in office, he administered the enormous United States naval construction program in the Korean War and the biggest construction job ever undertaken by the Civil Engineer Corps and the Seabees.

While the United States was engaged in the Korean War, the Bureau under Jelley started the construction of the great Cubi Point Naval Air Station on the island of Luzon in the Philippines. The air station was one of the largest construction projects ever undertaken by the United States. The Civil Engineers and Seabees whittled down mountains and filled the depths of Subic Bay to build the huge air base that now is an anchor in the United States defense system for Southeast Asia.

At the same time, Jelley was administering the construction projects required for fighting the Korean War. This conflict, using more men and materials than World War I, presented the Navy's Civil Engineers with unprecedented problems. He and his Civil Engineers and Seabees met the emergency. They built bases and logistic support stations throughout the Pacific to service the United Nation troops fighting in Korea. In Korea they also placed landing causeways for the invasion forces and built air bases and cantonments.

Joseph F. Jelley was born on May 2, 1904, in Phoenixville, Pennsylvania. He graduated from the United States Naval Academy at Annapolis on June 2, 1927. After serving two years aboard the battleship USS **Arkansas**, he returned to Annapolis for postgraduate work. From there, he went to Rensselaer Polytechnic Institute and earned his master's degree in civil engineering.

He served the usual round of bases and shipyards until 1942. In World War II, he was assigned to the Bureau headquarters in Washington, D.C., as Deputy Director of the Construction Department. From that date until August, 1944, he was in charge of the construction of numerous fuel depots, air stations, hospitals, housing units, and landing fields. For his work in this critical period, he was awarded the Legion of Merit.

In June, 1945, Jelley was transferred to the staff of the Fifth Naval Construction Brigade on Guam. He remained on Guam until January 1946, when he was promoted to Rear Admiral, returned to Washington, and was assigned as Deputy Chief of Civil Engineers and the Bureau. He was appointed Chief in December, 1949.

In November 1953, Jelley moved on to become Director of Construction in the Office of the Assistant Secretary of Defense, Properties and Installations. From that assignment, he went in 1954 to Pearl Harbor and assumed command of the Tenth Naval Construction Brigade and the Pacific Division of the Bureau of Yards and Docks. He served in that capacity until he retired from the Navy on June 14, 1957.

Rear Admiral Joseph F. Jelley 1949-1953



Rear Admiral John R. Perry 1953-1955



Rear Admirals usually start their careers as Ensigns, but John R. Perry really started at the bottom of the ladder when he enlisted as an Apprentice Seaman in World War I and then won his pilot's wings and a commission.

Born in Waco, Texas, on May 24, 1898, Perry was not satisfied with the short-cut method of becoming an officer. After the war, he resigned his commission to enter the United States Naval Academy at Annapolis, Maryland. Following his graduation, he served aboard a destroyer before returning to the academy for postgraduate training. He then moved on to Rensselaer Polytechnic Institute to take his bachelor's master's degrees in engineering. In 1927, he entered the Civil Engineer Corps, again as an Ensign.

Perry then served in Washington, D.C., Guantanamo Bay, Cuba, and several other stations before being posted to the Sixteenth Naval District Headquarters at Cavite, Luzon, Philippine Islands. With the coming of World War II, he was appointed Director of Administration and Personnel in the Bureau. In January, 1942, he was assigned the task of recruiting, training, equipping, and distributing the newly founded Seabees to mainland and outlying Pacific bases. For these efforts, he was awarded the Legion of Merit.

Elevated to the rank of Commodore in late 1944, Perry was ordered to Pearl Harbor as Officer in Charge of the Second Construction Brigade and Senior Brigade Commander and was a staff member of Commander Service Force, Pacific Fleet. As Senior Brigade Commander he was given the task of coordinating all naval construction activities in the Hawaiian Islands.

Commodore Perry moved into the Philippines as Commander Construction Forces, Leyte-Samar. He was in charge of constructing the huge naval bases there in preparation for the scheduled invasion of Japan. On June 24, 1945, Perry succeeded Commodore William M. Angas as Commander Construction Forces, Seventh Fleet, and Senior Brigade Commander in the Philippines. Following that, he served in various posts until November 3, 1953, when he climaxed his career by being appointed Chief of the Navy's Civil Engineers and Chief of the Bureau of Yards and Docks. While Chief, Perry reorganized the Bureau and field offices along similar lines, established the Atomic Research Branch of the Bureau's Research division, and completed the establishment of the Reserve Programs Branch as a division.

Admiral Perry died at the helm of the Bureau when a heart attack struck him down on September 25, 1955. He was the first Chief to die in office. He was signally honored when the Navy launched the USS **John R. Perry**, July 29, 1958. His wife officiated at the christening of the ship, a destroyer escort.

Perry 1953-1955

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Rear Admiral Robert H. Meade 1955-1957

During his term as Chief of the Navy's Civil Engineers and the Bureau of Yards and Docks, Rear Admiral Robert H. Meade left his imprint on three divergent areas of the world: Spain, Antarctica, and the Philippines. Seabees under his command built the great air bases in Spain which today are used by the nuclear bombers of the United States Air Force's strategic arm.

The big Naval Air Base at Cubi Point, Luzon, Philippine Islands, was completed during his administration. This air base is a key link in the Navy's defense system in Southeast Asia and was a monumental construction job—one of the largest single projects ever attempted. Meade, as Chief, also directed the Seabees who went to Antarctica to construct facilities for Operation Deep Freeze.

Meade was born on May 8, 1905, in Newark, New Jersey. Before his appointment to the United States Naval Academy, he studied civil engineering for a year at Stevens Institute of Technology. He graduated from the academy with distinction, standing 14th in his class of 456. He then spent a year with the fleet on the battleship USS **Florida** before returning to Annapolis for postgraduate work in civil engineering. Following this, he moved on to the Rensselaer Polytechnic Institute for further instruction.

From 1930 to 1943, Meade served the usual rounds of stations and Navy Yards as Public Works Officer, including a tour as Executive Officer of the Naval Construction Training Center at Norfolk, Virginia. During the Second World War, Meade was named Officer in Charge of the First Naval Construction Brigade in Alaska and the Aleutians. While directing operations of the Seabees on Attu, he was under enemy fire several times. Only four months after his arrival, he was awarded the Legion of Merit, primarily for his direction of construction on Kiska and Attu Islands. After a year in the Aleutians, he assumed command of the Seventh United States Naval Construction Brigade in Hawaii and took the Brigade to the Philippines during the spring of 1945. The Seventh Brigade was one of three assigned to build the huge bases on Leyte. For his work there, Meade was awarded a second Legion of Merit.

On his return to the mainland in September, 1945, Meade was appointed Director of Naval Oil Reserves. After a decade of numerous and challenging duties, he was named Chief of the Bureau of Yards and Docks and Chief of Civil Engineers on November 8, 1955. He retired on December 2, 1957, and then became associated with the New York engineering firm of Parson, Brinckerhoff, Quade and Douglas.



Rear Admiral Eugene J. Peltier 1957-1962



The image of Rear Admiral Eugene Peltier as Chief of the Navy Civil Engineers was that of able administrator and organizing genius who reshaped the Bureau of Yards and Docks to meet space-age demands. Under his guidance, the Bureau came to rival General Motors in property assessment value—about 20 billion dollars, managing a yearly budget approaching half a billion dollars.

In his administration, the Bureau built the great Lemoore jet air base in California at a cost of more than 100 million dollars. In Puget Sound Navy Yard, the massive floating drydock built to service the **Forrestal** class aircraft carriers is still operating. Scattered strategically throughout the United States and the rest of the world are the servicing installations for the Polaris-missile submarines. Numerous other feats of construction are credited to Peltier's management in bringing the Bureau into the space age.

Peltier completely reorganized the Bureau along cost-conscious, businesslike lines, wrote new operational manuals, retrenched command lines, and regrouped functions to produce new management proficiency.

Born in Concordia, Kansas, March 28, 1910, Peltier differed somewhat from his predecessors in that he enjoyed a successful career as a civil engineer and executive before joining the Navy Civil Engineers. He earned his degree in civil engineering from Kansas State College in 1933, and shortly afterward became Resident Engineer for the Kansas Highway Commission. He was commissioned a Lieutenant (jg) in the Naval Reserve in 1936 and was called to active duty in July, 1940.

Peltier's first assignment was as Public Works Officer at the Great Lakes Naval Training Station in Illinois; he then served in varying capacities around the country until February, 1945, when he was appointed Officer in Charge of the 137th Naval Construction Battalion which went to Okinawa. In September, 1945, he formed and was placed in command of the 54th Naval Construction Regiment on Okinawa.

After Okinawa, Peltier returned to the United States for tours as Public Works Officer at several Navy installations on the eastern seaboard, as well as a tour in Pearl Harbor as District Public Works Officer and Officer in Charge of Construction. In December, 1953, he was assigned to Washington as Assistant Chief of Operations, Bureau of Yards and Docks until he was appointed Chief of the Bureau and Chief of the Civil Engineers on December 2, 1957. He retired as a Rear Admiral on February 2, 1962, and is now in private business.

Peter Corradi demonstrated his courage when he went ashore with his fighting 33rd Seabees on Peleliu to hack out a fighter-aircraft landing strip while under heavy fire by the Japanese defenders; and as Chief of the Navy's Civil Engineers and the Bureau of Yards and Docks, he showed his mettle as an administrator and builder.

Projects carried out by the Civil Engineer Corps under Rear Admiral Peter Corradi's direction were diverse in type and scope: from the building of facilities for United States armed forces in Vietnam and Thailand to missile-tracking stations and water-desalting plants in the Caribbean.

After the missile crisis in Cuba in the latter part of 1962, when dictator Fidel Castro peevishly turned off the water at Guantanamo Bay, Corradi turned it back on. Navy Civil Engineers and Seabees were called in, and desalting plants were quickly installed to meet the needs of the Navy base.

Polaris submarine and missile facilities, including drydocks in Rota, Spain, Charleston, South Carolina, and Norfolk, Virginia, were begun or completed during his administration. A dozen training centers in the United States were completed. In Vietnam, Seabees sent by Corradi built bases, bridges, roads, and hospitals to help the young republic hold off the enemy.

Peter Corradi was born in Brooklyn, New York, on November 24, 1910. After taking evening courses at New York University for six years, he graduated in 1936 with honors and was granted a civil engineering degree. While attending the university, he worked as a draftsman and surveyor. After graduation he became an engineer with the Port Authority of New York.

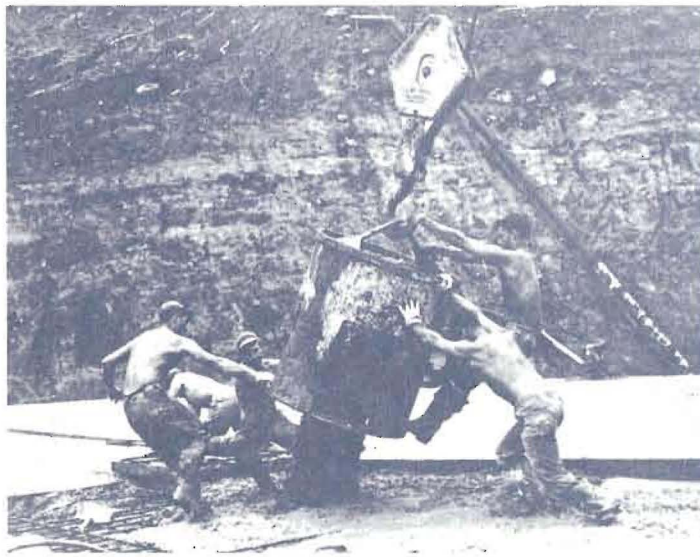
In November, 1940, Corradi joined the Naval Reserve and was commissioned a Lieutenant (jg) in the Civil Engineer Corps. He was called to active duty in January, 1941, and was appointed Resident Officer in Charge of Construction at Portsmouth Navy Yard, New Hampshire. During World War II, Corradi served as executive officer in several construction battalions in the Pacific. In March, 1944, he took command of United States Naval Construction Battalion 33. In September he led the 33rd Seabees ashore during the assault on Peleliu and earned a commendation from the Commanding General of the First Marine Division, William H. Rupertus. The 33rd Battalion won a Navy Unit Citation for its fighting and building, and Corradi was decorated with a Bronze Star for exceptional heroism in action against the enemy.

Following the war, he attained the rank of Captain and served at numerous Navy bases as Public Works Officer and in other capacities. In August, 1960, he was appointed Deputy Chief of Navy Civil Engineers and of the Bureau of Yards and Docks with the rank of Rear Admiral. In less than two years, he was appointed Chief. He is now vice president and general manager of a civil engineering firm.

Rear Admiral Peter Corradi 1962-1965



MEN



From this...

Although the Civil Engineer Corps, by that name, can look back upon 100 years of outstanding achievements, the accomplishments of Navy civil engineers go back another 50 years or so. It seems, therefore, legitimate to include in an account of CEC activities some items which predate 1867.

However, rather than follow a rigid chronological pattern in citing the Navy's civil engineering feats, let us mix the new with the old. The following are only examples of CEC activity and are not intended to be a complete listing.

Cubi Point

The largest construction project ever undertaken by the CEC and the Seabees was the Naval Air Station at Cubi Point, Philippine Islands. The earth-moving project alone was next only to that of the Panama and Suez Canals among the world's great engineering works.

Early in 1951, Construction Battalion Detachment 1802, headed by Lieutenant Robert R. Randall, CEC, USN, landed on the jungle-fringed beach at Cubi Point to make the initial survey. The entire region was a maze of swamps, gullies, and hills smothered under a thick jungle. A small Filipino fishing village clung to the beach.

In September 1951, Commander James Douglas of the Philippine Construction Regiment brought in his Seabees and proceeded to chew up the countryside. Early in 1952, the 30th Construction Regiment came from Guam and absorbed the original regiment. Douglas remained as commander of the new regiment and Officer in Charge of Construction.

One of the first things the Seabees did was to move the fishing village to Olongapo on the other side of Subic Bay. The natives welcomed this move, because they had been harassed for years by Huk guerillas. Seabee bulldozers cut 135 feet deep into the hilly promontory—the height of a 13-story building—where the long aircraft runway would soon stretch athwart the peninsula like the cross of a T.

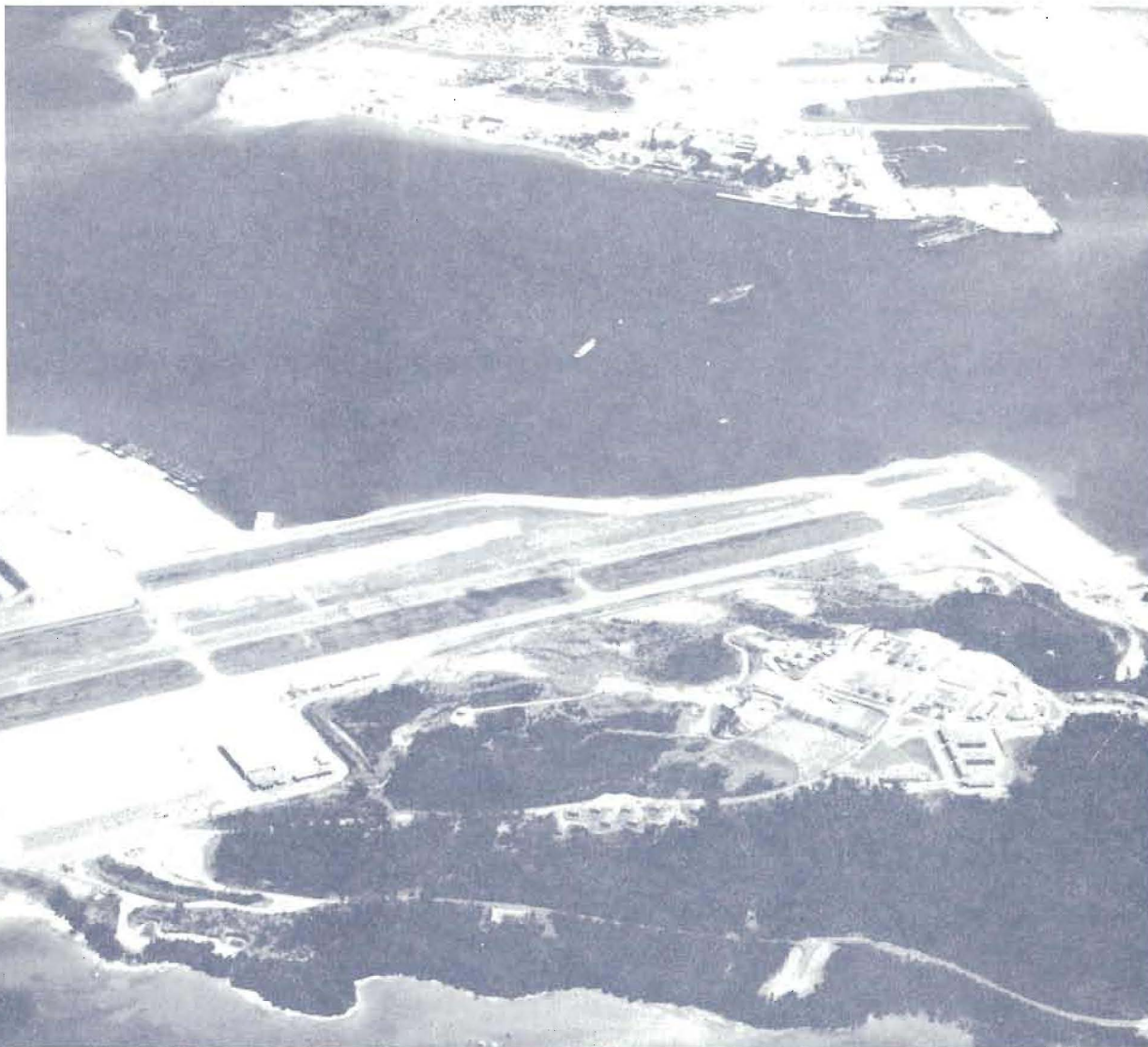
More Seabee units arrived, along with civilian contractors, and the jungle was swept away, mountains were mowed down, shoals were removed in the bay, and a deep-water access was cut to permit the berthing of aircraft carriers at a huge pier. The Seabees stripped the earth bare and put down a 10,000-foot runway 200 feet wide. The portion of the runway on the peninsula—8,000 feet—was made of reinforced concrete. At each end of the runway was a 1,000-foot overrun extending into the bay and built up on dredged and tamped coral fill.

METHODS

On May 10, 1952, less than a year after the first bulldozer tore a strip of red earth off the hillside at Cubi Point, a Navy SNJ-6 airplane touched down on the dusty, unfinished airstrip; aboard the airplane was Admiral Arthur W. Radford, then Commander in Chief, Pacific.

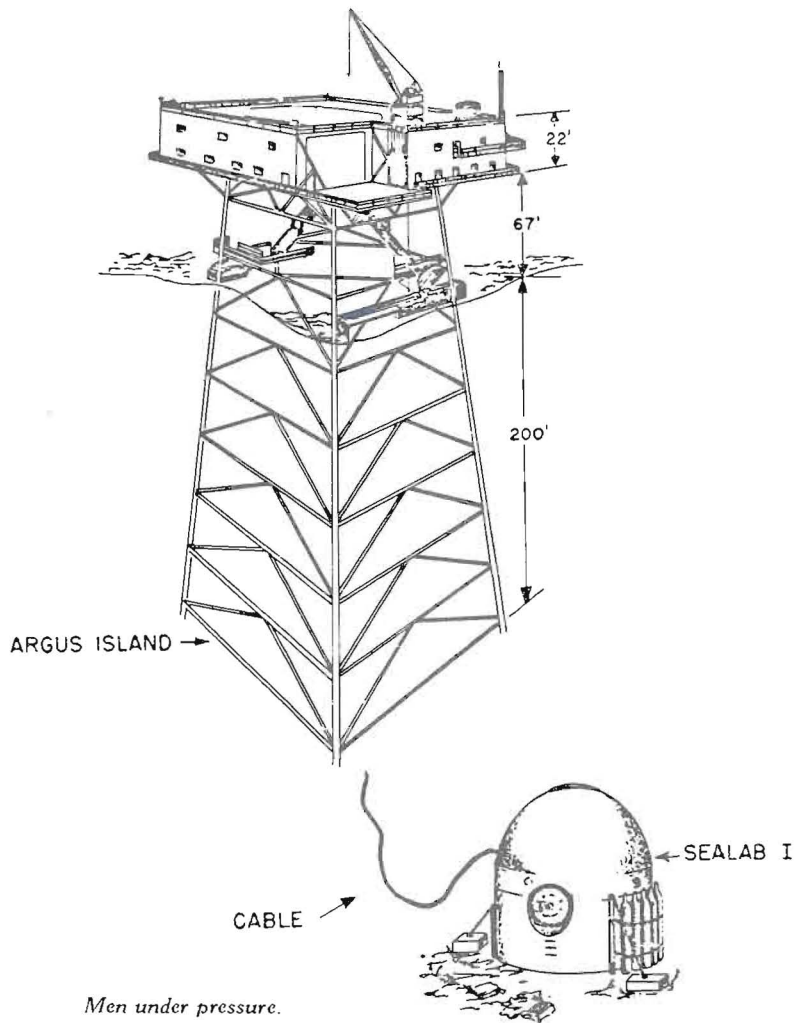
In the middle of 1952, Seabees whacked 85 feet off the top of Mount Maritan to eliminate what was an obstruction to incoming aircraft. In the Cubi Point operation, nearly 17,000,000 cubic yards of dirt and rock were moved, and another 7,000,000 cubic yards of earth were dredged from the adjoining Subic Bay.

The Naval Air Station was commissioned on July 25, 1956, and stands as a key in our Pacific defense wall and as a monument to the Navy's civil engineers and the Seabees.



...to this

MATERIALS



Argus Island

Thirty miles off the southwest coast of Bermuda stands Argus Island—a most unique island. It is a platform poised 67 feet above the water and resting on a tower atop an extinct volcano 200 feet below the ocean's surface. The legs of the tower penetrate 70 feet into the ocean floor to provide firm anchorage.

Argus is part of the Navy's Artemis project, an exploratory and development effort to perfect the use of transducers and high-gain receivers interfaced with computers to enable long-range location of submarines below the ocean's surface.

The island, actually a two-story structure, was built in two sections by a contractor in New Orleans, towed on barges to the site, and assembled. It is equipped with facilities necessary to maintain twenty people and their equipment. On the top deck there is a heliport, a radio tower, and a 15-ton revolving crane.

In addition to the scientific equipment housed in the structure, Seabees have installed an electric generating plant, a fresh water distillation plant, food and fuel storage facilities, and navigational warning devices.

The tower was built to specifications of the Bureau of Yards and Docks, which also served as administrator of the construction contract. The structure, costing \$1.6 million, was designed, fabricated, transported, and erected in slightly more than four months.

The design and construction of Argus Island was put to a severe test in 1962 when a powerful storm in the Atlantic generated high waves that smashed against the structure and knocked off stairways and many other appurtenances. Personnel were removed by helicopter as a precautionary measure, because a similar tower had collapsed with the loss of 28 lives in a storm the year before. But when the storm subsided, examination showed the tower had suffered no serious structural damage. It was remanned, and experimentation was resumed.

Admiral Peary in his flying days.

The North Pole and Peary

The Navy's involvement in polar expeditions cannot be cited as a specific construction project. However, no list of Civil Engineer Corps accomplishments would be complete without a discussion of Admiral Robert E. Peary's adventures in the cold regions of the world and his contributions in other areas.

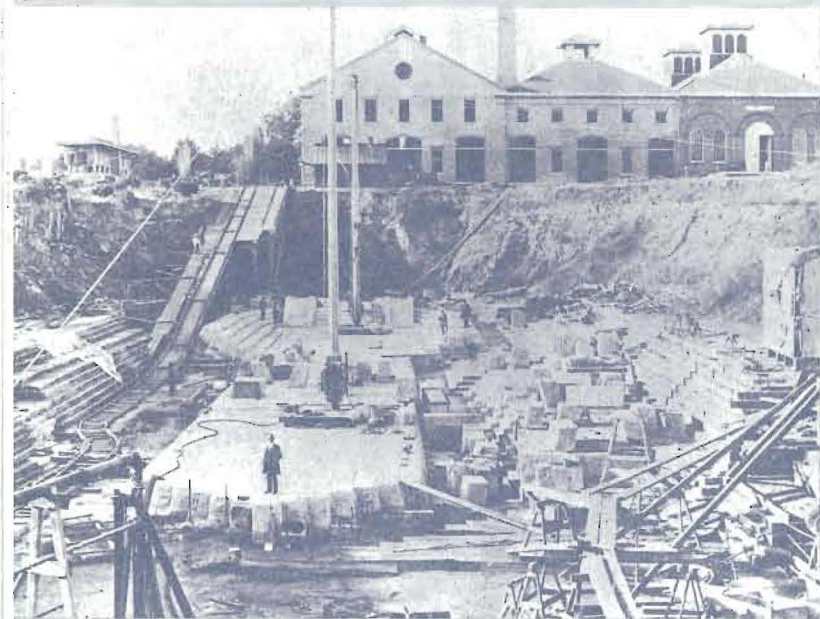
In the first decade of this century, Peary (then Commander) made several assaults on the Arctic ice, and in 1909 discovered the North Pole. His experiences there contributed greatly to the knowledge we now have about existing and working in that environment.

Peary became perhaps the best known of CEC officers. His fame as discoverer of the North Pole spread over the world. However, this was not his only claim to fame. After he retired in 1911 with the rank of Rear Admiral, he became a pioneer of the air age. Peary recognized in the efforts of the Wright Brothers the future of aviation and its importance in exploring, mapping, and military defense. He learned to fly at the age of 62. About this time, the United States entered World War I, and Peary was influential in having the United States establish a coastal air patrol comprised of seaplanes.

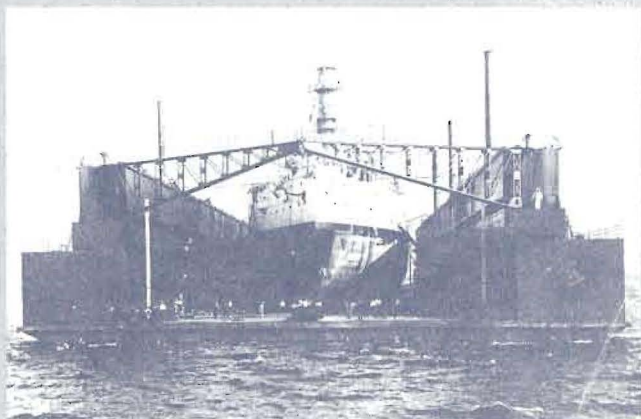
Peary's efforts to build the nation's air power, along with his previous strenuous activity in the Arctic, finally wore him down. He died in 1920 at the age of 63.



Drydocks—Old and New



Mare Island, 1878.



Dewey floating drydocks, 1905.

Essentially, a drydock is a long hole in the ground in which ships are placed for repairs. Generally, permanent drydocks face a parent body of water such as a river, a bay, or the sea. The water is let in, a ship is floated into the narrow dock, then a dam-like object called a caisson is tightly fitted across the open end and the water is pumped out. The ship is then sitting dry in the dock ready for workmen to repair the lower portions of the hull.

The responsibility for designing, building, and maintaining all of the Navy drydocks rests with the Navy's Civil Engineers and the Naval Facilities Engineering Command.

Most laymen do not realize that the huge ships we know today are relatively recent innovations. Though shipbuilding dates back into antiquity, the lack of drydocking facilities kept ship sizes within 100 tons. Cleaning and repairing ships always has been a difficult task. Ancient mariners, having no drydocks, would run their ships up on a handy beach to scrape off barnacles and replace damaged timbers. This was known as careening. Sometimes a marine railway was used, in which a track was put into the water and the ship floated over carrier cars on the rails. The ship was then pulled ashore.

The first drydocks built for the Navy were designed by Loammi Baldwin. Two were built simultaneously, one in the Norfolk Navy Yard and one in the Charlestown Navy Yard at Boston. One of the resident engineers under Baldwin was William P. S. Sanger who was later to become the first Chief of the Civil Engineer Corps.

Loammi Baldwin's granite block drydocks were begun in 1827 and completed in 1834. They are still in use today. The original drydocks were the forerunners of the hundreds of drydocks, presently scattered all over the world, that were built by the Navy's Civil Engineers. The first drydock built on the west coast was at Mare Island, California. It, too, was of granite block and was built in 1878.

The Navy Civil Engineers also developed the floating drydock, a useful structure which could be towed wherever it was needed. One of the most famous was the **Dewey** floating drydock built in New Orleans in 1905 and designed specifically to service the big battleships of President Theodore Roosevelt's Great White Fleet. In 1907 the **Dewey** floating drydock was towed to Olongapo in the Philippine Islands and served the Fleet there until the spring of 1942. At that time United States forces blew up the drydock to keep it out of the hands of the Japanese.

During World War II, Seabees used their famous pontoons to construct numerous advanced base floating drydocks. The pontoons were arranged in such a manner that many small craft, from LVPs to destroyers, could be repaired only a short distance from the battlefields.

Drydocks are the biggest and most useful tool possessed by the Naval Facilities Engineering Command, and the Navy's Civil Engineers are continually designing and building them and making improvements to keep the Fleet in readiness for any emergency.

Nuclear Power Plant at McMurdo Sound

Two prime considerations—logistics and safety—led to the installation of a nuclear power plant at the McMurdo Sound research station. The logistical problem involved the shipping and storing of enormous quantities of bulk oil to fuel the great number of electric generators and oil-fired heating units necessary to make life tenable in Antarctica. The safety consideration entailed the substitution of electric heaters for coal or oil burners, because the burners constituted a fire hazard in buildings that were frequently built of canvas and wood.

The production of electricity for McMurdo Station required the shipping of over 500,000 gallons of oil a year, 11,000 miles from the Continental United States, to say nothing of the storage facilities necessary to hold the fuel until it was used. In contrast, the fuel consumed by the PM-3A nuclear generator at McMurdo amounted to 64 pounds of uranium a year. Even considering the fact that an international agreement prohibited the disposal of atomic wastes in the Antarctic region and that all such wastes had to be stored and then shipped back to the United States for ultimate disposal, it was still possible to achieve a considerable savings in shipping and storage.

A third consideration governing the decision to install a nuclear plant at McMurdo was the fact that a seawater desalinization plant could be “married” to the power plant, thus providing a cheap and sure supply of fresh water to the camp to replace the expensive and haphazard method of obtaining water by melting snow.

In 1961 Seabees and officers of the Navy's Civil Engineer Corps were assigned to Antarctica to begin work on the PM-3A nuclear power plant, and early in 1962 the plant itself was erected. By March 3 of that year, the plant was operating.

The plant, which is operated by a specially trained team of 22 Seabees and two Civil Engineer Corps officers, supplies the McMurdo base with electricity for heat and light, steam to meet station needs, and energy to run the desalinization plant. The desalinization plant, when fully operative, can supply 14,000 gallons of fresh water daily.



McMurdo nuclear power plant in background.

Salvage at Pearl Harbor

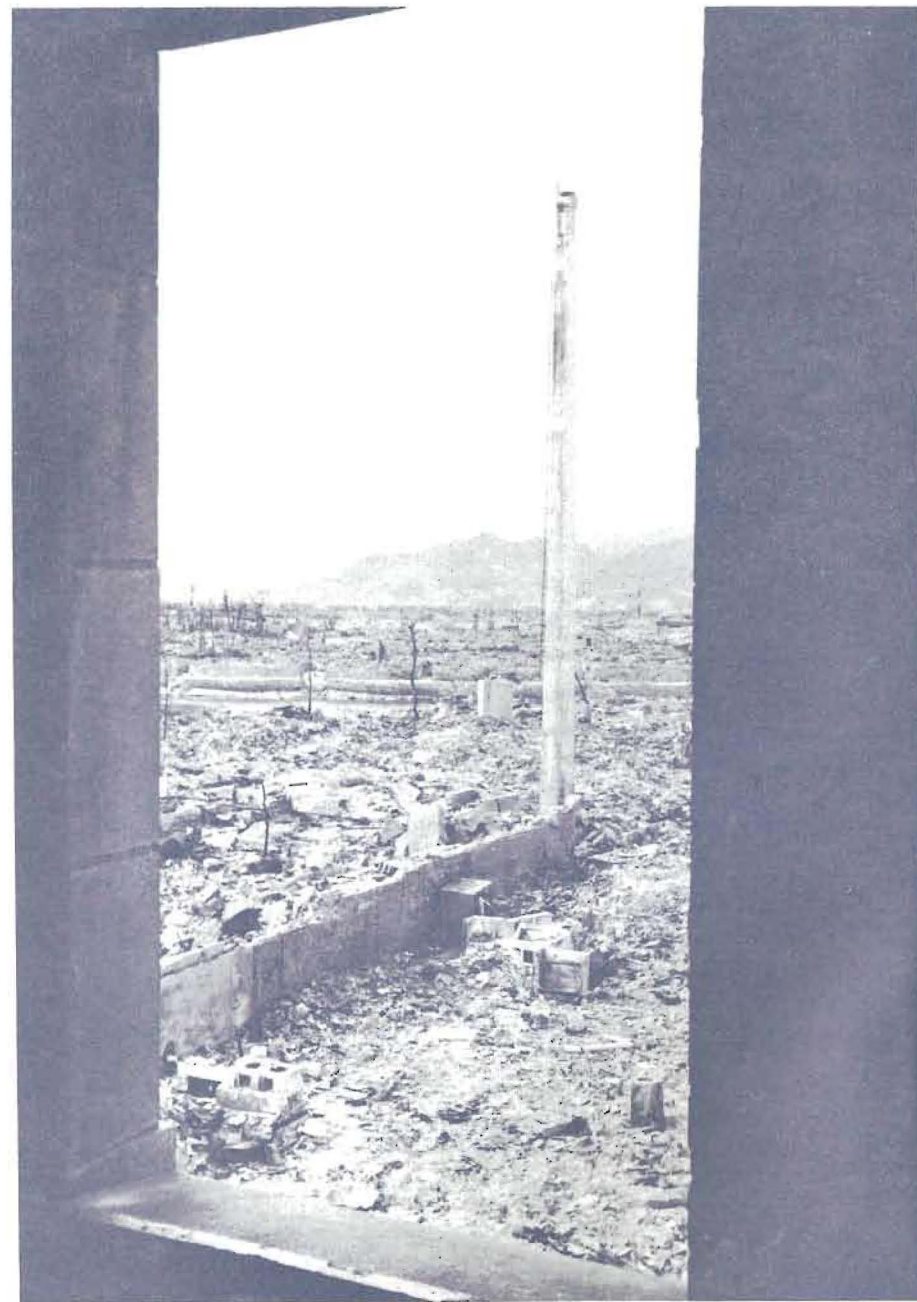
Five of the six battleships of the force that defeated the Japanese fleet in the Battle for Leyte Gulf were ships that had been damaged at Pearl Harbor. That the ships "lived to fight again" was largely due to the heroic salvage efforts by the United States Navy and its civilian employees.

Two of the ships, the USS **California** and the USS **West Virginia**, were afloat and in drydock just weeks after salvage crews of Seabees and civilian employees began work under Commander Wilfred L. Painter of the Navy Civil Engineers.

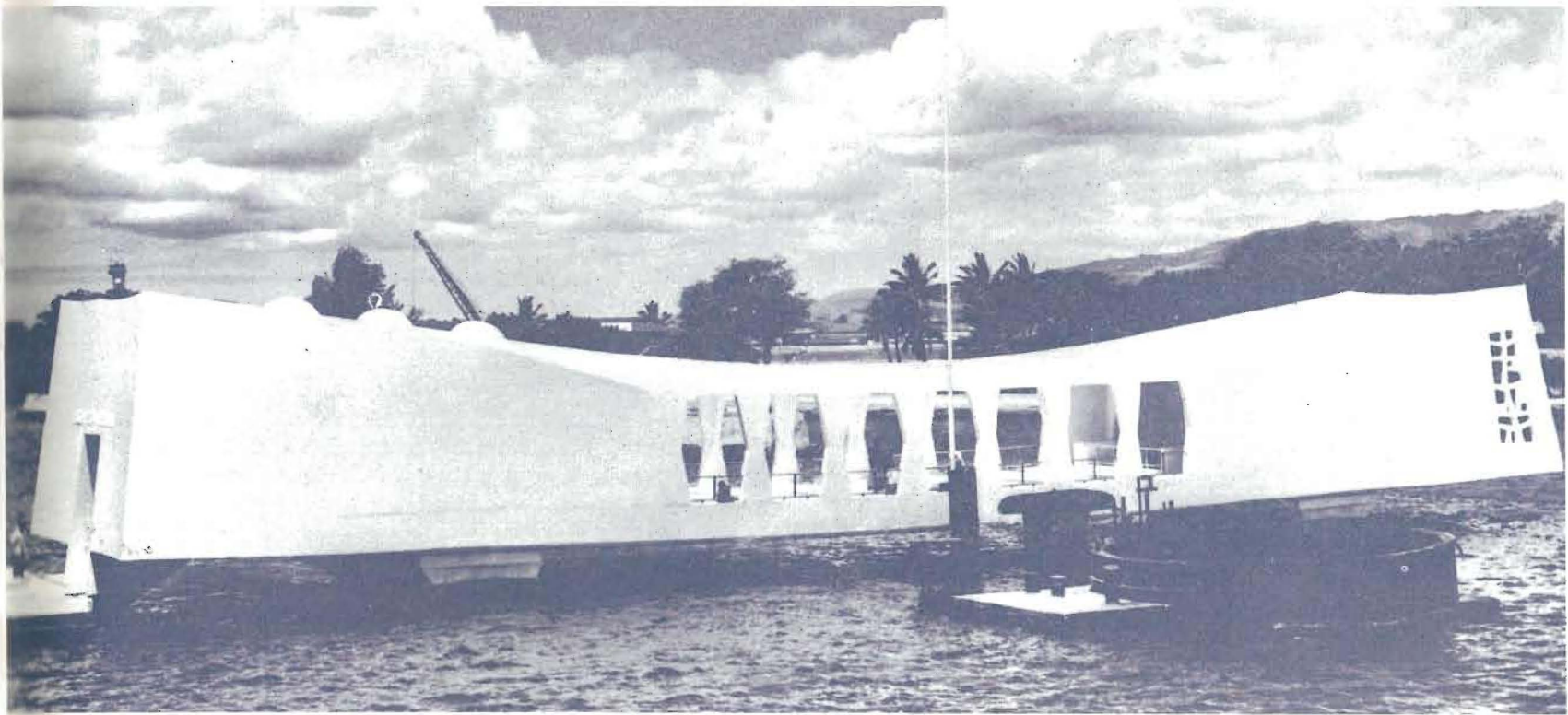
The **West Virginia** had been hit with six or seven aerial torpedoes which left her with gashes 120 feet long by 15 feet high in her hull. Bombs had compressed her top three decks to a point ten feet below where the third deck originally stood. The ship was also heavily damaged by fire. Under Painter's direction, 50-foot cofferdams were built and attached to the ship, and the water was pumped out. On 17 May 1942, the **West Virginia** was floated to the Navy drydock and a short time later it sailed to Puget Sound Navy Yard, under its own power, for modernization.

The **California** which had been hit by two aerial torpedoes and one bomb was further damaged by a near miss that tore open a large hole on its port side. When Commander Painter and his crew began salvage operations, the ship's main deck was under 17 feet of water. The hulls were plugged with cement, cofferdams were built on the deck, and pumping operations began. The **California** was floated on March 29, 1942, to a drydock where damage below the water line was repaired by yard forces. On June 7, 1942, the ship was released from the drydock. For his services in salvaging the two ships, Commander Painter was awarded the Navy Commendation Medal.

After having been sunk in the sneak attack on Pearl Harbor, the **West Virginia** and the **California** participated in the battles for Saipan, Tinian, and Iwo Jima, as well as in the battles for the Philippines at Leyte and Lingayen Gulf.



Ground zero at Hiroshima. CEC officers estimated damage.



Memorial to the Arizona

The memory of the 1,100 sailors who lost their lives when their battleship the USS **Arizona** was sunk on December 7, 1941, will be kept alive by a memorial built in their honor by the United States Navy. The gracefully curving white concrete structure which was erected over the sunken hull of the **Arizona** is in the shape of an enclosed bridge with an assembly area large enough to accommodate 200 people, a museum for momentos of the USS **Arizona**, and a shrine that contains marble plaques inscribed with the names of the men who lost their lives on the ship.

Authorized by Congress in 1957, the memorial was built with money donated by individual citizens of the United States and money appropriated by the state of Hawaii and the United States Congress. The memorial was designed by a private contractor under the direction of Captain N. Martinsen, CEC, USN, District Public Works Officer of the Fourteenth Naval District, and was built by contractors under the cognizance of the District Public Works Officer and the Public Works Officers of the Pearl Harbor Shipyard.

The structure is 185 feet long and varies in height from 14 feet at the center to 21 feet at each end. It is essentially a reinforced-concrete box-girder supported by concrete piles. There is a boat landing at the harbor end of the memorial, and visitors enter the structure through formal entry stairs.

Construction of the memorial was made difficult because all work had to be done over water. The contractor used Ford Island as a staging area and transported all equipment and materials on a surplus landing craft. To add to the difficulty, the structure was symmetrical about the centerline only, and each form was of a different height, width, and curvature. The memorial was designed to require very little maintenance; therefore, noncorrosive materials such as stainless steel, bronze, and polyvinyl chloride plastics were used.

The memorial was dedicated on Memorial Day, 30 May 1962, a truly dignified and appropriate reminder of those who gave their lives during the Japanese attack on Pearl Harbor.



Torokina, November 1943.

Torokina, February 1944.



Torokina Airfield

When the Seabees of the 71st Construction Battalion landed at Cape Torokina on Bougainville Island in the Solomons with orders to build an airfield, they were confronted with a marshy beach, a dense jungle, and heavy Japanese resistance. The United States was continuing its campaign of island-hopping and air bases were needed within striking range of the Japanese installations at Rabaul and Truk.

The first echelon of the 71st landed with the Marines on November 1, 1943, D-Day. Two days later they were surveying for an airstrip on a beach under Japanese fire. Additional elements of the battalion landed at intervals. By the 17th of November, the last echelon arrived and full-scale operations began. There was little choice in the location of the airfield since only a small percentage of the island was held by the United States. At times the builders actually worked beyond the front lines under sniper fire.

A worse location for a landing field could not be imagined, but since it was all they had, the Seabees continued. Trees were felled and hauled away, swamps were drained, and often it was necessary to wait for the sun to dry the land before bulldozers could be used. Coral rock from a nearby reef supplied the surfacing for the airstrip, and palm trees were used for lumber to build the many structures required.

By November 24, enough of the field had been surfaced and covered with Marston matting to allow a Navy SBD to make an emergency landing. On December 10, the first flight of Corsair planes landed to make the Torokina Airfield operational.

The field was planned to hold 35 fighter planes, but before the operation was over, it held several times that number. Along with the building of the airstrip, the Seabees were also working on access roads, camp facilities, and other facilities necessary to support the Air Corps group. These facilities were completed by December 10 as the airmen arrived, and the camp was finally completed on January 31, 1944.

Chu Lai Air Base

For the first time since World War II, a full-sized construction battalion rolled ashore in an amphibious assault when Mobile Construction Battalion Ten hit the beach at Chu Lai, Republic of Vietnam, on May 7, 1965.

American forces operating in "search and destroy" missions in the interior of the beleaguered republic were in need of more air cover when fighting the Viet Cong. Orders were issued for MCB Ten, led by Commander John M. Bannister, to move from Okinawa to Chu Lai to construct an airstrip. A reconnaissance of the coast south of Da Nang by Brigadier General M. E. Carl, USMC, and MCB Ten Operations Officer Lieutenant Frank Newcomb, CEC, USN, showed that the flat sandy beaches of Chu Lai were the best possible area for the construction of a jet air base.

Securing the site called for a tactically supported, full-scale amphibious assault on the beach. There was no port nearby and the hills back of the beach area were infested with Viet Cong. On D-Day a 19-ship task force from Okinawa landed the Seabees and assault infantry in the Fourth and Seventh Marine Regiments.

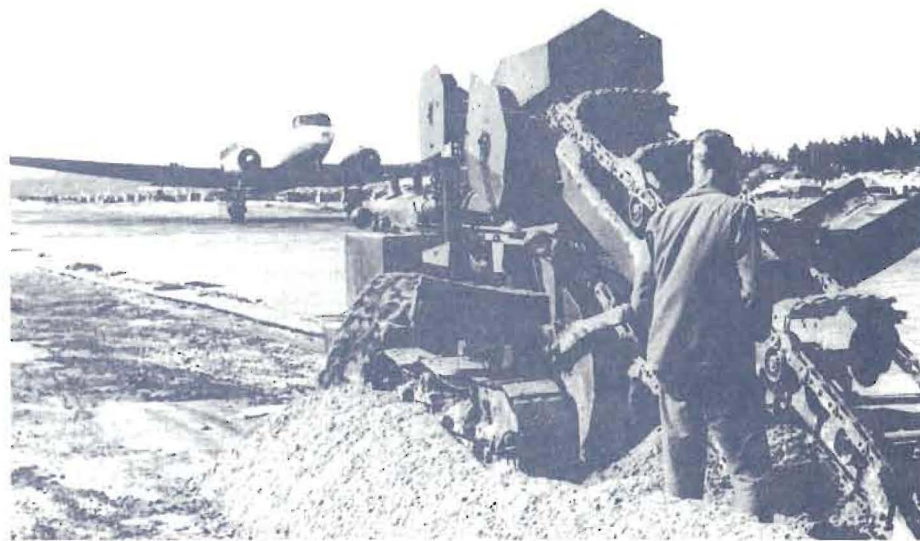
The Seabees quickly built a temporary 3,500-foot fighter strip of aluminum planking, hauling the equipment ashore over a pontoon causeway built by Amphibious Construction Battalion One. Plans called for a permanent concrete runway, but forces in the interior were in great need of air support, so the Seabees first built the temporary strip.

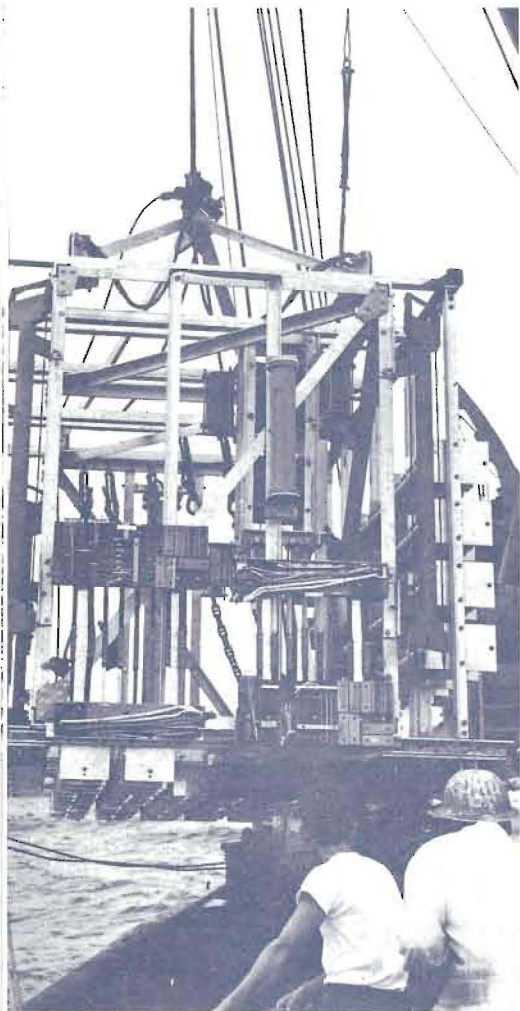
The fine-grained sand on the Chu Lai beach would not accept the usual asphaltic topping used to subsurface airstrips. Under the direction of their Navy Civil Engineer officers, the Seabees built an impervious barrier around the strip to hold ground water, then laid laterite clay over which they put the asphalt topping and, finally, the aluminum planks of the strip itself. The 2 x 12-foot planks interlocked to form a smooth surface. Only 23 days after the Seabees landed, the strip was completed and jets were operating off the short runway on June 1, 1965.

With the needs of tactical facilities met temporarily, the Seabees next began constructing the permanent base. The strip was lengthened to 8,000 feet, and a parallel taxiway and aircraft parking strips were built.



Chu Lai Air Base under construction in 1966.





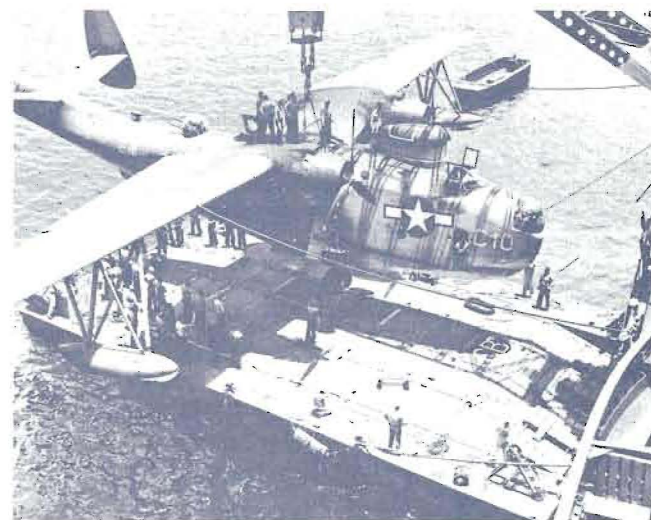
NCEL's Submersible Test Unit.

Submersible Test Unit

New concepts of naval warfare have stimulated a widespread and increasing interest in the deep ocean as an operating environment. The possibility of underwater weapon installations, surveillance systems, and storage facilities has not only opened a new area for naval operations, but it has opened up a Pandora's box of problems. The ocean is a hostile environment; materials exposed to the salt water of the earth's seas are not only subjected to the corrosive powers of the water itself, but are subject to the fouling and depletions of a multitude of marine organisms. In order to establish criteria for the construction and maintenance of structures in the deep ocean, it is necessary to understand that environment and its effects.

The Submersible Test Unit (STU), designed and constructed by the Naval Civil Engineering Laboratory (NCEL), Port Hueneme, California, is essentially a frame, built of either steel or aluminum on which several thousand specimens of material can be attached. The unit is lowered into the water to a prescribed depth and then retrieved after a predetermined time. The effect of the immersion of the specimens and of the structure itself can then be determined, and the knowledge gained can be applied to future construction.

Several STUs have been emplaced and retrieved, and scientists at NCEL have already learned much. Not only the device, but the system of lowering and retrieving it after months or years is an achievement in engineering. Under Captain Louis N. Saunders, Jr., CEC, USN, NCEL Commanding Officer and Director, the STU program is receiving appropriate attention as one of NCEL's major projects.



Pontoons as a repair platform in Okinawa . . .

The Magic Boxes

Pontoons are hollow watertight containers which can be used to float nonbuoyant devices. They were used by the Persians and the Romans in their military campaigns, and by the United States Army as early as 1846. But not until World War II were they put to so many varied uses. From simple hollow boxes, 5 x 7 x 5 feet in dimension, the Seabees and the Civil Engineer Corps officers made ferries, warping tugs, causeways, barges, drydocks, floating docks, and even a storage tank for water. The versatility of the pontoons was so remarkable that admirers dubbed them "magic boxes."

Shortly before the Japanese attack on Pearl Harbor, Captain John H. Laycock of the Navy's Civil Engineers had been experimenting with cigar box models in attempting to develop a system of joining together some sheet metal pontoons he had designed. Spurred on by the war's outbreak, he perfected a method using self-tightening, interlocking bolts and straps which made the combined pontoons as rigid as the individual pontoons. The coupled units were not only rigid, but were capable of supporting great weights. An outboard engine was tested and selected as the system propulsion unit, and the pontoon was ready to play its role in the dramatic military actions of World War II.



... and as a ramp in Normandy, 1944.

The need for structures of pontoons became apparent when the invasions of the beaches of Sicily and Italy were being planned. A means was needed to move equipment from offshore LSTs over shallow water to the shore—a distance of about 500 feet. Experiments showed that the Navy's pontoons, assembled as causeways, could be launched from shipside at full speed and be in position almost immediately.

But the use of pontoon systems did not stop there. When loading barges and repair barges were needed, the Seabees assembled the required number of the "magic boxes," added a motor or crane as necessary, and then sailed their new equipment into action.

When bridges were needed to cross the Rhine River in Germany, Civil Engineer officers and Seabees were there with pontoons to build a barge that could support a pile driver or float the bridge. When small ship repair facilities were needed, pontoons became drydocks. Whatever was needed—a seaplane ramp, a buoy, a breakwater, a dock, or a ferry to cross a river or hit a beach—Seabees and their officers of the Civil Engineer Corps with Captain Laycock's "magic boxes" could do it.

Guantanamo Desalinization Plant

On February 6, 1964, in retaliation for the arrest in United States territorial waters of 36 Cuban fishermen, the Cuban Government cut off the water supply to the United States Naval Base, Guantanamo Bay. This act threw Guantanamo into another crisis.

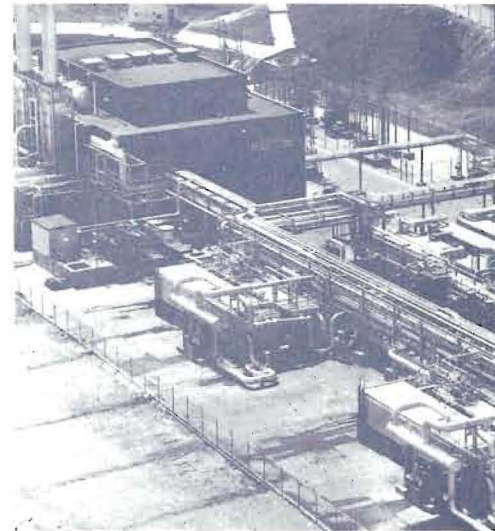
The Cuban Government had supplied the base's daily water consumption of 2,000,000 gallons by contracts signed in 1938 and 1959, the latter inherited from Acueducto Yateritas S.A. The water flowed to the base through pipelines from a pumping station on the Yateras River, which empties into upper Guantanamo Bay to the north of the naval base.

When the water was cut off, the base command immediately rationed water to 500,000 gallons daily. Barges brought emergency supplies from Jamaica. The water tanker, **Abatan**, equipped with evaporators and moored in the Bay against such an eventuality, provided a reserve supply. Two 4,000,000-gallon tankers, the **Tallulah** and the **Suamico**, were pressed into service and plied until the end of September between Guantanamo and Port Everglades, Florida.

These measures provided time for a long-term solution. A deep-well survey earlier had eliminated that expedient as a major source of water. A permanent solution to the problem came with the erection of desalinization plants, in line with the President's direction for base self-sufficiency. Cost of the three plants, each of 750,000 gallons daily capacity, was about \$10 million.

Under Bureau of Yards and Docks direction, the first of these, in operation by the Department of Interior at Point Loma, California, was dismantled in February and March and transported by ship to Guantanamo where it was in operation by July 30, 1964. Westinghouse International was the prime contractor for the remaining two. These went into operation on September 7th and December 6th of 1964.

For the civilian workers engaged in building the desalinization plant, Seabees of Mobile Construction Battalion Four prepared housing. This entailed electrical and plumbing work as well as minor building repairs. The Seabees had the housing facilities ready by 19 April 1964, four days after the arrival of the conversion plant from Point Loma.



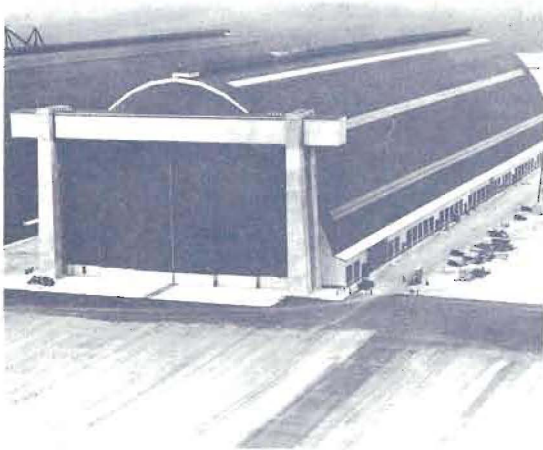
The new plant at Guantanamo converted seawater to fresh water at a cost of \$1 per 1,000 gallons. The Cuban rate had been 45 cents. The new high costs, however, were offset by the plant's generation of electrical power. Of 15,000 kilowatts daily production, only 3,500 kilowatts were needed to operate the plant, with 11,500 left over for the needs of the base.

Lakehurst Naval Air Station



The Hindenberg at mast at Lakehurst.

Construction of the world's largest military hangar began in 1922. The building is 807 feet long, 200 feet high, and 264 feet wide.



Originally a bleak, wind-swept area of 1,300 flat acres known as Camp Kendrick, an Army chemical warfare testing facility, the Lakehurst Naval Air Station was established in 1919. Scattered among the stunted pines abounding the land were some rickety barracks and storehouses. These primitive facilities were used by the public works officers until more adequate ones were built.

The Navy Civil Engineers had to build hangars, gas-cell plants to store and process helium, repair shops, personnel quarters, and fuel and ammunition dumps for a variety of rigid dirigibles. In the 1930s, a series of crashes wiped out the dirigible arm of the Navy and activity at Lakehurst was at a low ebb. When World War II came, Lakehurst Naval Air Station blossomed again when the Navy discovered their nonrigid blimps were ideal antisubmarine vehicles. All the facilities so carefully built up by the Civil Engineers were used for the defense of the East Coast. Almost everything built in the early years—the runways, mooring masts, circular mooring pads, ammunition storage, helium plants, and the huge hangars—was put into service.

The huge hangar and the gas-cell plants, which were considered obsolete and were used only to service seven small blimps, now became the focal point for the antisubmarine warfare program. With these facilities, the Navy serviced blimps and barrage balloons which protected merchant marine convoys sailing into the Atlantic.

Following the war, Lakehurst continued to service lighter-than-air craft, but Civil Engineer Corps officers began to build numerous other air-age installations as Lakehurst activity increased. The Navy established a parachute rigging school, an aerographer's school, and a helicopter rescue school.

Lakehurst entered the space-age programs with installations of tracking antennae for the SYNCOM satellite and the National Space and Aeronautics Administration. Hangar Number 1 was found to be the only facility large enough to service and test the Echo I and II balloon satellites: the satellite had to be inflated with helium and searched for leaks and flaws before being shot into space.

Lakehurst Naval Air Station grew from 1,300 acres to its present sprawling 7,600 acres. Though the blimps were finally retired in 1962, the old helium plant still produces and processes the gas for use by both industry and space science. In fact, more helium is produced now than when the big dirigibles were operating out of the station in the early 1930s.

Panama Canal

Although the Panama Canal and the canal routes in Nicaragua were not Navy projects, Navy civil engineers were key figures in their planning. The first Navy civil engineer to work on the isthmus project was A. G. Menocal, a civilian, who went to Panama to survey likely routes for a canal. It was Menocal's opinion that Nicaragua was the best site for the canal, because no locks would be needed and the construction would be cheaper and easier.

After many surveys in Nicaragua in which Navy Civil Engineers Robert E. Peary and Mordecai Endicott participated, the project was abandoned. The United States then bought the French interests and equipment in Colombia, where the French had bogged down in their attempts to put a canal through the Isthmus of Panama. After Panama revolted in 1903, breaking away from Colombia, President Theodore Roosevelt signed a treaty with the new nation that gave the United States the Canal Zone in perpetuity.

Lieutenant Colonel George W. Goethals of the Army Corps of Engineers headed the new Panama Canal Commission; he was assisted by Harry H. Rousseau, a young Senior Lieutenant in the Navy Civil Engineer Corps who had taken a reduction in rank from Rear Admiral and CEC Chief to sit on the commission and work on the canal. Rousseau later became terminal engineer and director of the Panama Railroad and actually finished the Panama Canal, directing the construction of the locks, repair shops, cranes, and fueling depot.

Mulberry A

"To provide against the risk of interruption by weather and to augment the tonnages which can be handled initially over the beaches and later through reconstructed ports, artificial ports will be improvised to give facilities for discharge within sheltered water of various amounts of war material and supplies. These facilities will be provided in at least two artificial parts."

With these cold words, the search began to find the equipment and the techniques necessary to develop a harbor where none existed on Normandy's hostile shoreline.

When President Franklin D. Roosevelt and Prime Minister Winston Churchill met at Quebec in 1943 with their Joint Chiefs of Staff, known collectively as the Combined Chiefs of Staff, they were assured that a beachhead could be seized by their ground forces to launch the war of liberation in Europe. But supplying enough material and men to hold the beachhead was another matter. What was needed was a harbor. There were, of course, natural harbors on the west coast of France, but these would be heavily defended and might take weeks or even months to capture, at a costly price in men and equipment and much too late to support the initial stages of the invasion.

The problem was turned over to engineers and technicians of both the United States and the Allies. They developed plans for an artificial harbor that could be made up of floating steel caissons, submerged concrete caissons, sunken ships and floating piers—all towed into position with the invasion fleet and deployed rapidly enough to allow the original invasion forces to be reinforced and resupplied.

The harbor was devised with an outer breakwater composed of floating steel pontoons called "Bombardons," to reduce the full force of the waves before they reached the inner breakwater which consisted of a series of concrete caissons, called by the code name "Phoenix," which were towed into position, flooded, and sunk.

It was this system which was dubbed "Mulberry." The string of Phoenix's made up an L-shaped breakwater 6,500 feet long. The main barriers were parallel to the beach and 4,500 feet off shore in about 30 feet of water. An arm 1,600 feet long extended to the beach. Within the Mulberry, lines of ships were sunk along the 15-foot level which formed an excellent shelter for ships close to shore. These were called "Gooseberries."

With the sheltered areas provided by the Gooseberries, floating pontoon piers were installed which connected to land. These allowed the material unloaded to be transported directly to the shore. This arrangement cut the unloading time from 12 hours to something under 1 hour.

Although the components of the harbor off Omaha Beach were devised by many men and organizations, the layout and placement facilities were headed by engineers of the Civil Engineer Corps. The components were manned by Seabees who traveled on them as they were towed from Great Britain. They had spent many months training in the techniques of assembling the artificial harbor.

Before the harbor components could be placed, Civil Engineer Corps Officers, Seabees, and other Navy men who made up the Underwater Demolition Teams had to destroy sunken craft and obstacles placed in the water by the German defenders. It was while participating in this activity that the first American, a Civil Engineer Corps officer, was killed on Omaha Beach. German gunfire hit the explosives he was carrying.

The first elements of Task Force 128 arrived off Normandy on June 7, 1944. By June 18, Mulberry A was nearly completed.

On June 19, in spite of all predictions to the contrary, a heavy storm broke in the channel and in its aftermath Mulberry was left a shattered wreck. "Gooseberry," a smaller system made up of sunken ships, became the primary artificial harbor at Omaha Beach and proved adequate in supplying and reinforcing the invading forces.



Mulberry A pontoon breakwater off Omaha Beach, 1944.

Artificial harbor made with sunken ships during Normandy invasion, 1944.





Pacific Missile Range, Point Mugu, California.

Pacific Missile Range

In 1946, Point Mugu, situated on the California coast, was the site of the Navy Air Missile Test Center. In 1958 this relatively small test center expanded into the Pacific Missile Range, an enormous complex of satellite and missile tracking facilities that now stretches 10,000 miles across the Pacific Ocean. This vast and sophisticated network, encompassing radar, airstrips, special buildings and launching sites was designed and constructed under the supervision of Navy Civil Engineers.

Naval Communications Station

On the plains of Marathon, where embattled Athenians stood in 490 B.C. facing the hordes of Xerxes' Persians, today stands a United States Naval Communication Station, part of a vast network linking continental stations and ships at sea. The installation is an important unit in the system on which the United States depends for instantaneous and dependable communication.

The facility, erected entirely by Seabees under the supervision of Civil Engineer Corps officers, was designed to be recoverable and transportable. Support facilities are housed in prefabricated buildings while the operational facilities are housed in transportable vans. Work began on the communi-

cation station when a detachment of Mobile Construction Battalion Six arrived in Greece and started preparing the site early in 1963. The area allotted for the project was swampy. Over 250,000 cubic yards of earth had to be hauled in to provide solid sites for structures and as fill for access roads to the antenna fields.

After the site was prepared, the Seabees erected over 100 wood and metal antenna towers, 3 operational buildings, and 11 support buildings. They built roads and installed security fencing, drainage systems, and other utilities. The work progressed in spite of unfavorable weather conditions, limitations of land for construction, and delayed shipments of material and equipment from the United States. In 1964, Mobile Construction Battalion Eight took over and completed the project, which was turned over to Fleet personnel on January 20, 1965.

Naval Ordnance Test Station

Strangely enough, the largest United States naval base in area is located on the desert, nearly 200 miles from the ocean. The Naval Ordnance Test Station, China Lake, California, occupies an area of 1,025 square miles, which makes it larger than the state of Rhode Island. Navy Civil Engineers designed and supervised the construction of a small city, including housing for civilian and military personnel, as well as the missile testing and research facilities. The main laboratory—Michelson Laboratory—has nearly 11 acres of floor space.



Michelson Laboratory under construction at NOTS China Lake, 1946.

U. S. Naval Communication Station Seabees line up on the plains of Marathon.





THE CIVIL ENGINEER CORPS—AND THE NAVY

The Navy's mission is to support fundamental national policies and interests throughout the world by control of the sea—its surfaces, its depths, and the air above it. The operating forces who directly carry out this mission require a vast network of shore facilities. These facilities make up the Naval Shore Establishment, and the Civil Engineer Corps (CEC) has the responsibility of designing, constructing, and maintaining them.

In the Vietnam conflict, the Naval Facilities Engineering Command—nerve center of the CEC—has been designated the contract construction agent for the Department of Defense in Southeast Asia, which represents the biggest single construction project in the world.

Today, more than ever, there is a need for knowledgeable and competent Civil Engineer Corps officers to meet the mounting demands of our space-age fleet. A qualified person, regardless of race, creed, or national origin, will find the CEC a rewarding, challenging career.



How Can You Qualify?

If you are a recent graduate in engineering from an institution accredited by the Engineer's Council for Professional Development, you probably have the basic requirements for becoming an Ensign in the Civil Engineer Corps by attending Navy Officer Candidate School at Newport, Rhode Island.

If you have been out of school for some time, a program recently initiated offers direct appointments as Lieutenant or Lieutenant Commander for individuals with 5 or 12 years of post-degree experience, respectively. The Navy Recruiting Offices listed at the end of this pamphlet will gladly provide further information on each of these programs.

You can tell from the following descriptions of CEC officers' duties if your experience will help you to qualify.

Public Works. As Public Works Officer at one of the Navy's shore stations, the CEC officer supervises the maintenance, repair, and improvement of all buildings, structures, and grounds. His organization maintains and operates the utility systems, including electricity, telephones, water, heating, refuse collection, and sewage. It also maintains and operates the automotive, construction, and weight-

handling equipment. At a large Navy station, the Public Works organization will often total 500 or more civilian workers.

Contracts. New facilities at Navy shore bases are constructed under the supervision of a CEC officer. For a large project, there is a senior officer with perhaps several junior officers who are responsible for specific phases of the work. The CEC officer in charge is responsible for the design of the facility, preparing specifications, advertising for bids, executing the contract, and inspecting the construction to assure satisfactory completion.

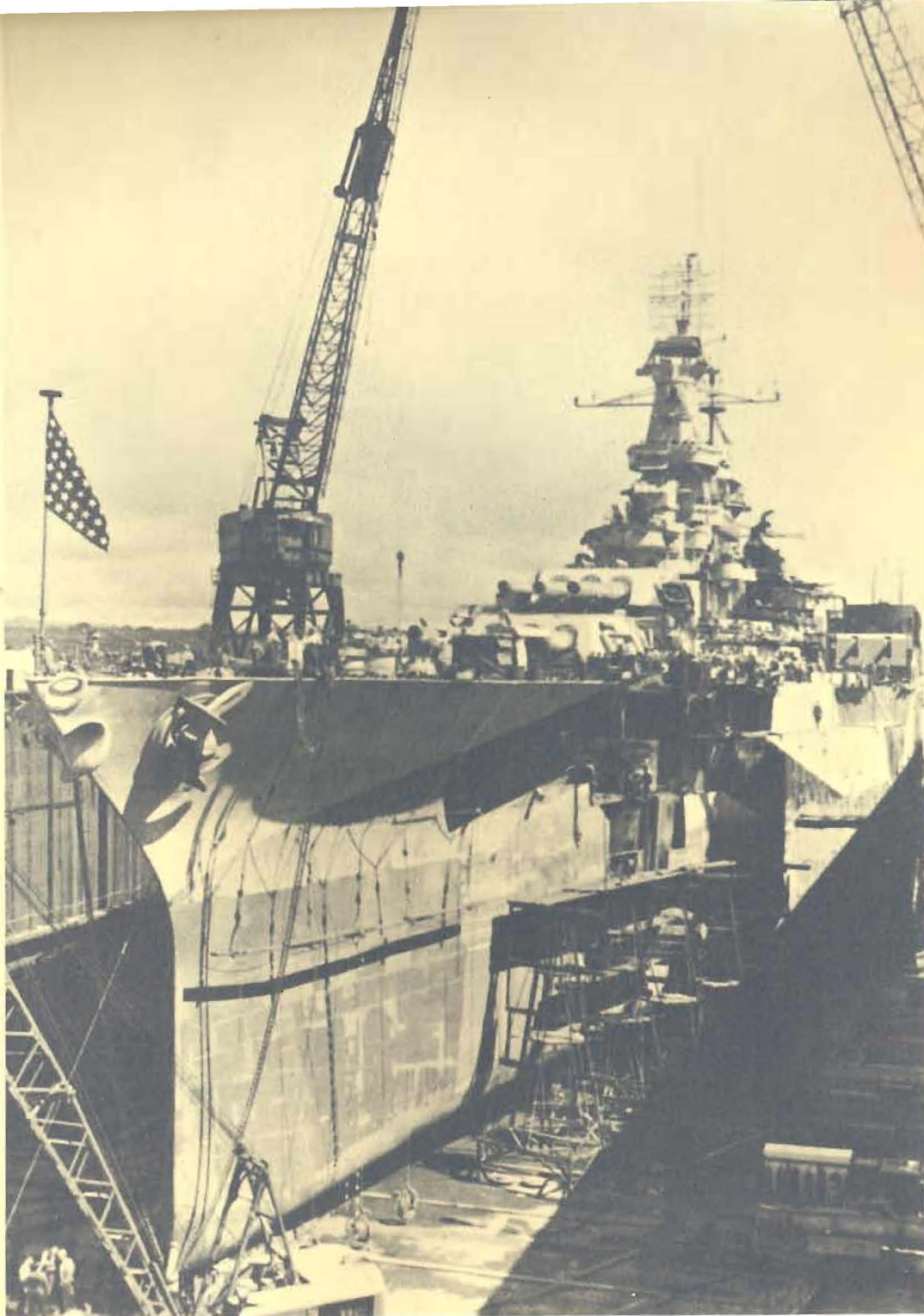
Seabees. Some of the overseas construction is done under contract, but much of it is accomplished by the Seabees—the Navy's military construction organization. CEC officers have commanded the Seabees since their inception early in World War II. Recently, in Vietnam, the Seabees have proved themselves to be the same bold and dependable builder-fighters they were during World War II and the Korean conflict. Seabee duty offers an opportunity for CEC officers to gain vital experience in the actual direction of men in field construction under the most trying conditions. The CEC officer in this activity must become proficient in military defensive tactics in order to help protect what is being built if it becomes necessary to do so.

MAIN NAVY RECRUITING STATIONS

STATION	PHONE	ADDRESS
Albany, N.Y. 12207	472-4424	Post Office Building, Broadway
Albuquerque, N.M. 87103	247-0311	U. S. Courthouse Bldg, 5th & Gold Streets
Birmingham, Ala. 35203	325-3840	2121 8th Avenue, North
Boston, Mass. 02210	223-6220	560 Atlantic Avenue
Buffalo, N.Y. 14203	842-2310	1021 Main Street
Chicago, Ill. 60605	828-6611	536 South Clark Street
Cleveland, Ohio 44114	241-7900	CTS Building, 1404 East 9th Street
Columbia, S.C. 29201	AL2-5639	Court House, 1100 Laurel Street
Columbus, Ohio 43215	469-6673	74 East Gay Street
Dallas, Texas 75202	R19-2981	Wholesale Merchants Building, 912 Commerce
Denver, Colo. 80202	297-3274	New Custom House, 19th & California Streets
Des Moines, Iowa 50309	284-4322	Federal Office Building, 5th & Court Streets
Detroit, Mich. 48226	226-7797	Federal Building, Fort & Shelby Streets
Houston, Texas 77004	FA3-9271	2320 LaBranch Street
Indianapolis, Ind. 46204	633-8893	54 Monument Circle
Jacksonville, Fla. 32202	356-3076	537 Riverside Avenue
Kansas City, Mo. 64108	FR4-3431	2420 Broadway
Little Rock, Ark. 72201	373-4361	Old Post Office Building, 2nd & Center Streets

STATION	PHONE	ADDRESS
Los Angeles, Cal. 90015	688-2747	1041 South Broadway
Louisville, Ky. 40202	582-5176	Post Office Building, 6th & Broadway
Macon, Ga. 31201	743-0381	451 College Street
Milwaukee, Wis. 53202	272-8600	611 North Broadway
Minneapolis, Minn. 55401	334-2171	Federal Bldg, 2nd & Washington Avenues, South
Nashville, Tenn. 37203	242-8321	U.S. Court House, 801 Broadway
New Orleans, La. 70116	527-6212	U.S. Customs House, 423 Canal Street
New York, N.Y. 10011	620-6481	207 West 24th Street
Oklahoma City, Okla. 73102	CE6-2311	American General Building, 621 North Robinson
Omaha, Neb. 68111	221-7311	Naval Personnel Center, 30th & Fort Sts., Bldg 19S
Philadelphia, Pa. 19107	597-4680	Blackburn Building, 13 South 13th Street
Pittsburgh, Pa. 15219	644-5887	Federal Building, 1000 Liberty Avenue
Portland, Ore. 97204	226-3361	Pioneer Post Office, 520 S.W. Morrison Street
Raleigh, N.C. 27602	833-6634	Fayetteville & Martin Streets, P. O. Box 2506
Richmond, Va. 23219	649-3611	1 East Broad Street
San Francisco, Cal. 94102	MA1-3828	Federal Office Bldg. Leavenworth & Fulton Sts.
Seattle, Wash. 98121	MA4-4337	2222 2nd Avenue
St. Louis, Mo. 63102	MA2-5261	Federal Building, 208 N. Broadway
Washington, D. C. 20004	393-2169	631 E. Street, Northwest

OFFICER PROGRAMS IN THE U.S. NAVY, INCLUDING COMMISSIONS IN THE CIVIL ENGINEER CORPS, ARE OPEN TO ALL, REGARDLESS OF RACE, CREED, OR NATIONAL ORIGIN.



USS California being salvaged at Pearl Harbor.

Historical information provided by NAVFAC/CEC/Seabee
Historian

Copy prepared and illustrated by personnel of NCEL's
Technical Support Department

